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**AN ASSESSMENT OF THE RETAIL FOOD ENVIRONMENT, ACCESS TO
FOOD, AND FOOD SECURITY IN MISSOULA, MONTANA IN REACTION TO
THE SOCIOECONOMIC AND HEALTH STATUS OF ITS RESIDENTS**

by

Jennifer Rae Elliott

B.S. Montana State University, 2007

Presented in partial fulfillment of the requirements for the degree of

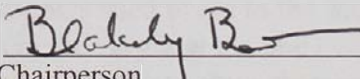
Master of Science

Health and Human Performance

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May 2009

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Chairperson

Dean, Graduate School

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Thesis Abstract

Elliott, Jennifer Rae, M.S., May 2009

Health and Human Performance

An assessment of the retail food environment, access to food, and food security in Missoula, Montana in relation to the socioeconomic and health status of its residents

Committee Chair: Blakely Brown Ph.D.

BB

Inadequate access to healthy food sources may contribute to less nutritious diets and an increased risk for chronic disease. Numerous studies on nutrition environments and food access have found disparities between low income neighborhoods and higher income neighborhoods in regards to access to supermarkets and healthier foods. The purpose of this study was to examine the retail food environment, access to food, and food security in Missoula, Montana in relation to the socioeconomic and health status of its residents.

This study was conducted in four neighborhoods based on the average median family income level of each neighborhood as defined by the 2000 U.S. Census. Each neighborhood fell into one of the following categories: very low income, low income, medium income, and high income. Neighborhood boundaries were defined using census tracts. Data were collected at supermarkets, grocery stores, and convenience stores in the four selected neighborhoods. The retail food environment was assessed using the Nutrition Environment Measures Survey for Food Stores (NEMS-S). Food security, access to food, and health status were analyzed using a food store shopper survey which included the Six-item Short form U.S. Household Food Security Module and the SF-12v2 Health Survey. Data were collected in both September and February to account for any seasonal variability in food selection, food access, and food security.

The results from this study indicate that there is no relationship between the retail food environment in the four neighborhoods assessed and the food security or health status of food store shoppers within each neighborhood. However, there was a significant difference in the type of transportation food store shoppers used to get to the food store among the four neighborhoods. Food store shoppers in the very low income neighborhood were more likely to walk to the food store than food store shoppers in the other neighborhoods and food store shoppers in the very low income and medium income neighborhoods were more likely to ride their bike to the food store than food store shoppers in the low income and high income neighborhoods.

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CHAPTER I

INTRODUCTION TO THE STUDY

It is estimated that 300,000 deaths per year in the United States are attributed to obesity and obesity-related disease, such as cardiovascular disease, diabetes, and some cancers (U.S. Department of Health and Human Services [DPHHS], 2008). In the past 30 years, the prevalence of overweight and obesity among U.S. adults has nearly doubled. In Montana, the percentage of adults who are obese has increased from less than 10 percent in 1990 to between 20-24 percent in 2006 (Center for Disease Control and Prevention [CDC], 2008). In the United States and Montana, cardiovascular disease is the leading cause of death and accounted for nearly 24 percent of the states deaths in 2001 (CDC, 2008).

Many factors play a role in the increase of overweight and obesity among Americans. One such factor, which is beginning to gain more recognition among researchers and health promotion experts, is the built environment in which we live (Glanz, Sallis, Saelens, & Frank, 2005; Hill & Peters, 1998; Merchant, Dehghan, Behnke-Cook, & Anand, 2004; Moore, Diez Roux, Nettleton, & Jacobs, 2007; Zenk, Schulz, Israel, James, Dao, Wilson, 2006). The U.S. food environment is characterized by an almost unlimited supply of convenient, inexpensive, energy-dense food, coupled with a lifestyle that requires very little physical activity and energy expenditure (Hill & Peters, 1998).

In examining the relationship between built environment and the prevalence of overweight and obesity, researchers have begun to look specifically at food access and

the nutritional quality of certain environments, such as neighborhoods, schools and workplaces (Glanz, Sallis, Saelens, & Frank, 2005; Hill & Peters, 1998; Jetter & Cassady, 2006; Zenk, et al., 2006). Glanz, Sallis, Saelens, & Frank (2007) have developed a tool for measuring healthy nutrition environments: the Nutrition Environment Measures Survey (NEMS). NEMS measures nutrition environments through the examination of the two main food access sources in our society – restaurants and retail food stores. This study uses the Nutrition Environment Measures Survey in Stores (NEMS-S) to assess the availability of healthy options, price, and quality of food at retail food stores in Missoula, Montana.

Retail food stores most commonly include supermarkets, grocery stores, and convenience stores. Bakeries, meat markets, and specialty food stores can also be considered retail food stores, but with a limited variety of food offerings (Glanz, Sallis, Saelens, & Frank, 2007). It has been shown that there is a relationship between neighborhood access to supermarkets and the prevalence of disease. Morland and others (2006) found that neighborhoods that had at least one supermarket had a 9% lower prevalence of overweight and a 24% lower prevalence of obesity compared with neighborhoods that had no supermarkets. Access to supermarkets is important because supermarkets most commonly provide the highest variety of “heart healthy” food items compared with other retail food stores (Sallis, Nader, & Atkins, 1986).

Numerous studies on nutrition environments and food access have found disparities between low-income neighborhoods and higher-income neighborhoods in regards to access to supermarkets and healthier foods (Bakelaar, Dwyer, Roy, & Jones-Robinson, 2006; Glanz, Sallis, Saelens, & Frank, 2007; Horowitz, Colson, Hebert, &

Lancaster, 2004; Jetter & Cassady, 2006; Moore & Diez Roux, 2006). Fewer supermarkets are located in minority and low-income neighborhoods (Bakelaar, Dwyer, Roy, & Jones-Robinson, 2006; Glanz, Sallis, Saelens, & Frank, 2007; Horowitz, Colson, Hebert, & Lancaster, 2004; Moore & Diez Roux, 2006; Moore, Diez Roux, Nettleton, & Jacobs, 2007) and healthier food items such as fruits and vegetables are more expensive relative to income in these neighborhoods compared with higher-income neighborhoods (Zenk, et al., 2006).

In 2004, the Missoula County Community Food and Agriculture Coalition (CFAC) administered a food assessment survey to 624 Missoula County residents for the purpose of learning about food-related concerns of Missoula County residents. Results of this study indicate that Missoula residents are most concerned with food quality, local food, price of food, food availability, and transportation to food stores, with the last three being particularly important to low-income residents. In order for community groups such as CFAC to advocate for changes in the local food system, it is necessary to first understand the nutrition environment within the community and what community residents view as food-related concerns (Jacobson et al., 2004).

This study builds on the research done by Missoula CFAC and that of other prominent researchers around the country. Access to affordable healthy foods of acceptable quality is an important component of community food security (Zenk et al., 2006). Food security is defined as access by all members of a family at all times to enough food for an active, healthy life (United States Department of Agriculture [USDA], 2007). By conducting a cross sectional study of the retail food environment and access to food in Missoula, this study contributes to the understanding of the local food

environment and how built environments can influence the health and well-being of community residents.

PURPOSE OF THE STUDY

The purpose of the study was to examine the retail food environment, access to food, and food security in Missoula, Montana in relation to the socioeconomic and health status of its residents.

STATEMENT OF THE PROBLEM

Inadequate access to healthy food sources, such as supermarkets, may contribute to less-nutritious diets and an increased risk for chronic, diet-related diseases (Morland, Diez Roux, & Wing, 2006; Zenk et al., 2005). One of the many goals set forth by Healthy People 2010 is to educate the public about the long-term health consequences and risks associated with being overweight and how to achieve and maintain a healthy weight (DPHHS, 2000). Yet, when access to healthy foods is limited within a community and access to high-fat, low-density convenience foods is abundant, individual level nutrition education will provide little or no results in reducing the prevalence of overweight and obesity at a societal level (Block, Scribner, & DeSalvo, 2007; Berg, 2006). In order to meet the goals of Healthy People 2010, it is necessary to define the nutrition environment of a community which will then provide a foundation for nutrition education, food-related advocacy, and informed strategies to improve the food environment.

The prevalence of obesity is much higher among the poor and minorities (DHHS, 2001). Several studies have shown the disparity between access to healthful food in low-income and minority neighborhoods compared with high-income neighborhoods (Glanz,

Sallis, Saelens, & Frank, 2007; Jetter & Cassady, 2006; Sloan et al., 2003). Joel Berg, executive director of the New York City Coalition Against Hunger puts it this way, "If you can't find the foods, or if you can't afford them, you can't eat them" (2006).

Therefore, it is important to assess the retail food environment in Missoula in relation to income-level in order to begin to make the connections between built environment and personal diet and to address any food disparities that might exist.

RESEARCH QUESTIONS

1. What is the relationship between neighborhood median income level in Missoula, Montana and the accessibility of healthy retail food?
 - a. What is the distribution of retail food stores in very low-income, low-income, medium-income, and high-income Missoula neighborhoods?
 - b. What is the nutritional quality of retail food stores in very low-income, low-income, medium-income, and high-income Missoula neighborhoods?
2. Is there a relationship between grocery shopper characteristics (including: food security, number of people shopped for in household, distance traveled to food store, time spent grocery shopping per week, and average amount of money spent on groceries per week) and the nutritional quality of the food store he/she chooses to shop at?
3. Is there a relationship between the nutritional quality of retail food stores within a neighborhood and the health status of the people who shop at the retail food stores in that neighborhood?
4. Why do grocery shoppers choose to shop at certain food stores?

5. How do grocery shoppers access food stores?
 - a. What form a transportation do grocery shoppers use to travel to food stores?
 - b. How far do grocery shoppers travel to food stores?
 - c. How far are grocery shoppers willing to travel to food stores?

DELIMITATIONS

The study is delimited to food stores (supermarkets, grocery stores, and convenience stores) in Missoula, Montana. The study is further delimited to those food store shoppers who voluntarily answered a series of survey questions.

LIMITATIONS

The limitations of the study were as follows:

1. Demographic information used to set parameters within the study are limited to 2000 U.S. Census data.
2. Survey data collection and interpretation is limited due to the convenience sample.
3. Generalization of the results is limited to Missoula, Montana.

DEFINITION OF TERMS

Community nutrition environment: the number, type, location and accessibility of food outlets (Glanz, Sallis, Saelens, & Frank, 2005).

Consumer nutrition environment: what consumers encounter in and around the places where they buy food, including: availability, price, promotion, placement, and quality of food (Glanz, Sallis, Saelens, & Frank, 2005).

Convenience Sample: sampling a population based on convenience.

Cross-sectional Research: a type of research in which changes in a population over time are studied by collecting data at a single point in time on several variables (Gall, Gall, & Borg, 2005).

Environment: the space outside of the person (Sallis & Owen, 2002).

Food Security: access by all members of a family at all times to enough food for an active, healthy life (United States Department of Agriculture [USDA], 2007).

Inter-rater Reliability: two different raters assess one store and the results are compared for discrepancies (Glanz, Young, & Carvalho, 2006).

Nutrition Environment Measures Survey (NEMS): a comprehensive set of tools that characterize nutrition environments in neighborhoods. These tools have been proven both reliable and valid (Glanz, Sallis, Saelens, & Frank, 2005).

Retail Food Store: a food service establishment selling commercially prepackaged food items for consumption outside the store.

Supermarket: large, corporate-owned “chain” store (Morland, Wing, Roux, & Poole, 2002) more likely to have on-site food preparation such as a deli or bakery (Powell, Auld, Chaloupka, O’Malley, & Johnston, 2007).

Grocery store: smaller noncorporate-owned food store (Morland, Wing, Roux, & Poole, 2002).

Convenience store: smaller store with a very limited variety of foods (Liese, Weis, Pluto, Smith, & Lawson, 2007), and may be connected to a gas station.

Stratified Random Sample: a sample involving the identification of subgroups with certain characteristics in the population and drawing a random sample from each subgroup (Gall, Gall, & Borg, 2005).

CHAPTER II

REVIEW OF LITERATURE

The purpose of the study was to examine the retail food environment, access to food, and food security in Missoula, Montana in relation to the socioeconomic and health status of its residents. The retail food environment was assessed using the Nutrition Environment Measures Survey while a survey of retail food store patrons measured access to food, food security, and the health status of food store patrons. Data in this study was analyzed in relation to the average median family income level of the sample neighborhoods. Rationale for conducting this study came from literature pertaining to health environments, with a focus on nutrition environments, and the possible influence of these environments on access to food and nutrition related disease. Included in the literature review are the following sections:

1. Obesity and Chronic Disease
2. Studying Health and Nutrition Environments
3. Consumer and Community Nutrition Environments
4. Food Access Disparities
5. Ecological Model of Health
6. Research Methods
 - a. Neighborhood Selection
 - b. Store Classification
 - c. Survey Methods

OBESITY AND CHRONIC DISEASE

The vast quantity of overweight and obese people in the United States has become a major public health concern (DPHHS, 2001). The World Health Organization (WHO) (2008) estimates that more than 41% of adult females and 36% of adult males in the United States are obese (BMI ≥ 30 kg/m²). The prevalence of overweight and obesity in the United States has increased steadily among all ages, both gender groups, and all racial and ethnic groups (Mokdad, A., Ford, S., Bowman, B., Dietz, W., Vinicor, F., Bales, V., et al., 2003). Among women, non-Hispanic black women (53%) and Mexican-American women (52%) have an increased prevalence of obesity compared to white women (39%). There is no statistical difference among men of the same ethnicities (National Center for Health Statistics [NCHS]). The prevalence of overweight children in the United States has more than tripled since 1980 (DPHHS, 2001). In Montana, the percentage of adults who are obese has increased from less than 10% in 1990 to between 20-24% in 2006 (CDC, 2008). Heart disease is the leading cause of death in Montana, accounting for nearly 25% of the state's deaths in 2001 (CDC, 2008).

One of the greatest concerns of overweight and obesity is chronic disease (Kumanyika et al, 2008). Chronic diseases related to obesity include: cardiovascular disease, type-2 diabetes, stroke, hypertension, high blood cholesterol, osteoarthritis, asthma, and several types of cancer (DPHHS, 2001). In addition to higher rates of chronic disease, individuals who are obese have a 50 to 100% increased risk of premature death compared with individuals at a healthy weight (DPHHS, 2007). In the year 2000, it is estimated that the total cost of obesity in the United States was \$117 billion (DPHHS,

2008) With more than 1 billion overweight adults globally, 300 million of which are clinically obese, overweight and obesity has reached epic proportions worldwide (WHO, 2008).

STUDYING HEALTH AND NUTRITION ENVIRONMENTS

The environment – the place where one lives, works, plays, shops, etc. – can have a positive or negative impact on healthy living (Frank et al., 2007). The environment is related to health through the socio-cultural rules that govern the environment, the socio-economic status of the environment, and the physical design of the environment (Lake & Townshend, 2006). Each of these environmental components influences the health of individuals beyond that of individual health risk factors (Feldman & Steptoe, 2004). A range of assessment methods have been used in current research on the relationship between environment and health, including: indirect methods, intermediate methods, and direct methods. The continuum of assessment methods used in current research to assess environmental influences on health is shown in *Figure 1* (Booth, Pinkston, & Poston, 2005; Lake & Townshend, 2006).

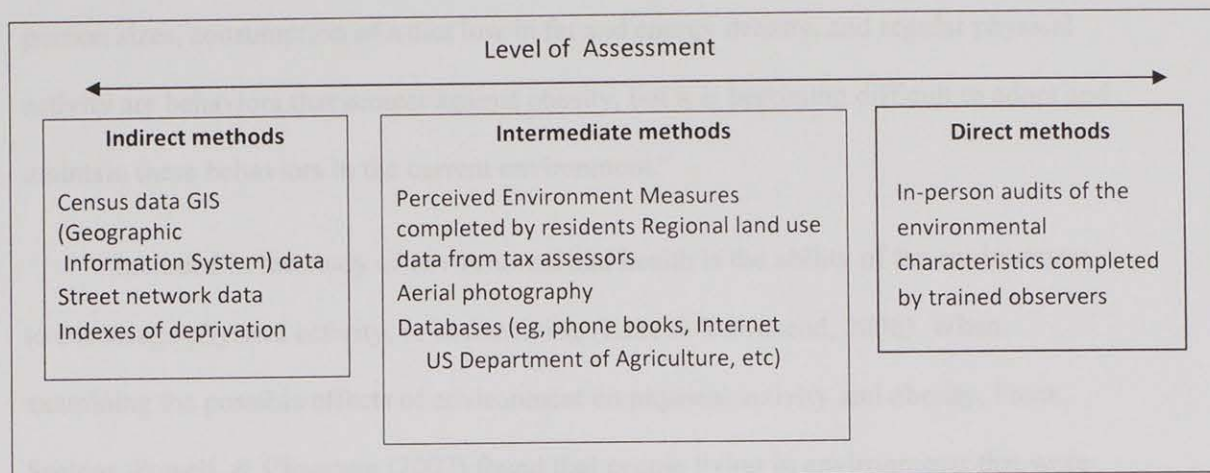


Figure 1: Continuum of methods for measuring the built environment (Booth, Pinkston, & Poston, 2005)

Recent research has linked environment to the development of overweight and obesity (Booth, Pinkston, & Poston, 2005). In their review of current research concerning the relationship between obesity and environment, Booth, Pinkston, & Poston (2005) found obesity to be linked with area of residence, resources, walkability, television, land use, sprawl, and poverty. So, the weight-management advice to just “eat less and move more” ignores the complex influence of these environmental factors on a person’s ability to access affordable nutritious food (Glanz, Sallis, Saelens, & Frank, 2005) and live an active lifestyle (Lake & Townsend, 2006).

Because many communities are no longer designed to facilitate physical activity, engaging in activities such as walking or bicycling to work or school is no longer a natural part of a daily routine for most people (CDC Foundation, *no date*). In addition to being less physically active, the U.S. society has become increasingly reliant on convenience and fast foods and consumes much larger portion sizes than ever before (Sallis & Glanz, 2006). A study done by Hill & Peters (1998) states that “control of

portion sizes, consumption of a diet low in fat and energy density, and regular physical activity are behaviors that protect against obesity, but it is becoming difficult to adopt and maintain these behaviors in the current environment.”

Included in the study of environment and health is the ability of the environment to encourage physical activity, or active living (Lake & Townsend, 2006). When examining the possible effects of environment on physical activity and obesity, Frank, Saelens, Powell, & Chapman (2007) found that people living in environments that were more walkable, drove less than people living in environments that were less walkable. Also, those who preferred walking were more likely to increase their walking and decrease their vehicle use only if the environments were suitable to walking. The findings from this study suggest that creating more walkable environments may result in more physical activity, less driving, and a slightly lower prevalence of obesity for those people who prefer a walkable environment (Frank, Saelens, Powell, & Chapman, 2007).

Nutrition environments, defined as the availability, affordability, and accessibility of retail food stores, are believed to be related the increase in overweight, obesity, and chronic disease (Glanz, Sallis, Saelens, & Frank, 2005). A landmark study on nutrition environments done by Cheadle et al. (1991) looked at the availability of healthful products in grocery stores and the reported consumption of healthful products by individuals who lived near those stores. Results showed that in most cases, the amount of shelf space provided for a product positively correlated with the consumption amount for that product. Since this study, researchers have been trying to find a valid and reliable way to develop and test measures of nutrition environments. In 2007, Glanz and others created the Nutrition Environment Measures Survey (NEMS). This valid and reliable

survey was created to test nutrition environments through the evaluation of restaurants (NEMS-R) and retail food stores (NEMS-S).

NEMS-S assesses retail food stores through the evaluation of ten indicator food items focusing on the availability of healthful food items, quality of produce, and price (Glanz, Sallis, Saelens, & Frank, 2007). NEMS-R assesses restaurants for availability of healthful food items, facilitators and barriers to healthy eating, price, and signage/promotion of healthy and unhealthy foods (Saelens, Glanz, Sallis, & Frank, 2007). Used either together or separately, NEMS-S and NEMS-R are useful in examining possible associations between nutrition environments, eating behavior, obesity, and chronic disease (Glanz, Sallis, Saelens, & Frank, 2007; Saelens, Glanz, Sallis, & Frank, 2007).

COMMUNITY AND CONSUMER NUTRITION ENVIRONMENTS

There are four areas that make up the nutrition environment: community nutrition environment, consumer nutrition environment, organizational nutrition environment, and the information environment (Glanz, Sallis, Saelens, & Frank, 2005). *Figure 2* illustrates the four nutrition environments and how each is affected by policy, government, and other organizations and industries. Consumer and community nutrition environments have been labeled as two environments needing the most study due to lack of previous research on these environments and due to the broad potential effects they each have on chronic disease (Glanz, Sallis, Saelens, & Frank, 2005). Community nutrition environments include the number and type of food store, location of food stores, and access to food stores, while consumer nutrition environments include what the consumer

encounters in and around food stores, such as availability, promotion, cost, and quality of food (Glanz, Sallis, Saelens, and Frank, 2007).

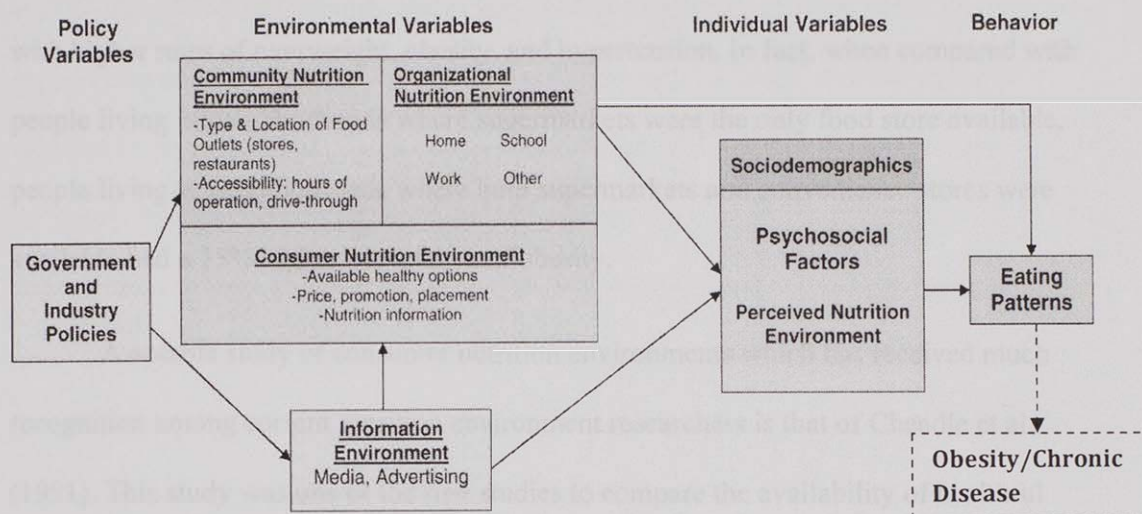


Figure 2: Model of the Nutrition Environment adapted from Glanz, Sallis, Saelens, & Frank, 2005

Community level access to food sources have been looked at in several recent studies. Bakelaar, Dwyer, Roy, & Jones-Robinson (2006) mapped the location of food resources, including retail food stores, restaurants, soup kitchens, food pantries, farmers markets, and community gardens in three New York City neighborhoods to examine access to nutritious food among low-income New Yorkers. Horowitz, Colson, Hebert, & Lancaster (2004) compared the availability and cost of foods recommended for people with diabetes in two New York City neighborhoods by assessing the number, type and quality of retail food stores in each neighborhood. Morland, Diez Roux, & Wing (2006) looked at the association between the availability of supermarkets, grocery stores, and

convenience stores and risk factors for cardiovascular disease among the Atherosclerosis Risk in Communities (ARIC) study participants. They found that the presence of supermarkets within a neighborhood was associated with lower rates of overweight, obesity, and hypertension and that the presence of convenience stores was associated with higher rates of overweight, obesity, and hypertension. In fact, when compared with people living in neighborhoods where supermarkets were the only food store available, people living in neighborhoods where both supermarkets and convenience stores were available had a 35% higher prevalence of obesity.

A notable study of consumer nutrition environments which has received much recognition among current nutrition environment researchers is that of Cheadle et al. (1991). This study was one of the first studies to compare the availability of healthful food items in grocery stores and food consumption among local residents. The amount of shelf space provided for certain food items and nutrition education materials and displays were assessed in grocery stores in 22 (11 intervention, 11 control) communities in California and Hawaii. In a more recent study, Glanz, Sallis, Saelens, & Frank (2007) assessed the consumer nutrition environment of the retail food stores in four neighborhoods in Atlanta, Georgia. The study looked at price, shelf space, quality of food, and consumer nutrition information for food items such as milk, meat, fresh fruits and vegetables, and baked goods. It was found that across all stores and neighborhoods most healthier food options were comparable in price to regular options of the same foods. Healthier options that were consistently higher priced when compared to their regular options were lean hotdogs, lean ground beef, and baked chips. More healthful

options were available at grocery stores compared with convenience stores, and in higher income neighborhoods compared with lower income neighborhoods.

A local study conducted by the Missoula Food and Agriculture Coalition (CFAC) in 2004 found that food quality issues (food safety and access to fresh food) was the biggest concern among survey respondents. Access to local foods, availability of the kinds of foods people like to eat, and transportation to food stores were also valid concerns of survey respondents. Of the 624 survey respondents in this study, approximately 77% identified price of food as at least somewhat of a concern or problem for them and 65% of respondents identified having enough money to buy the food they needed for themselves and their families as at least somewhat of concern or problem for them (Jacobson et al., 2004).

Moore, Diez Roux, Nettleton, & Jacobs (2007) found that among participants in their study of the local food environment and diet quality, those participants with no supermarkets near their home were 25-46% less likely to have a healthy diet compared with participants who had the most supermarkets near their home. Additionally, those participants who lived in areas with the worst-ranked food environments were 22-35% less likely to have a healthy diet than those participants living in the best-ranked environments. Low quality food environments and low access to food are both related to less nutritious diets, greater risk for chronic disease, and diet-related disease (Zenk, Schulz, Israel, James, Bao, & Wilson, 2005).

FOOD ACCESS DISPARITIES

Numerous studies on nutrition environments and food access have found disparities between low-income neighborhoods and higher-income neighborhoods in regards to access to supermarkets and healthier foods (Bakelaar, Dwyer, Roy, & Jones-Robinson, 2006; Glanz, Sallis, Saelens, & Frank, 2007; Horowitz, Colson, Hebert, & Lancaster, 2004; Jetter & Cassady, 2006; Moore & Diez Roux, 2006). This is evidenced by the fact that fewer supermarkets are located in minority and low-income neighborhoods (Bakelaar, Dwyer, Roy, & Jones-Robinson, 2006; Glanz, Sallis, Saelens, & Frank, 2007; Horowitz, Colson, Hebert, & Lancaster, 2004; Moore & Diez Roux, 2006; Moore, Diez Roux, Nettleton, & Jacobs, 2007) and healthier food items such as fruits and vegetables are more expensive relative to income in these neighborhoods compared with higher-income neighborhoods (Zenk, et al., 2006). Access to supermarkets and other quality food stores and the availability, selection, and quantity of low priced foods are important components of community food security (Zenk et al., 2006). The USDA (2007) defines food security as access by all members of a family at all times to enough food for an active, healthy life.

In 2006 Jetter & Cassady compared the price and availability of a standard market basket of foods and a healthier market basket in 25 stores in neighborhoods of varying income levels in Los Angeles and Sacramento. A standard market basket consisted of food items such as bread, cheese, chicken, flour, milk, ground beef, tuna, rice, and spaghetti. Data indicated that the healthier market basket was 17% - 19% more expensive across all neighborhoods compared with the standard market basket. The higher cost of the healthier market basket was equal to 35% - 40% of the low-income consumers' food

budget at \$2,410 a year. Results also showed that food stores in low and very low-income neighborhoods were more likely not to carry some of the food items in the standard and healthier market basket than stores in the medium and high-income neighborhoods.

A similar study done by Horowitz et al. (2004) was designed to document and compare the availability and cost of food items recommended for people with diabetes in two different New York City neighborhoods: East Harlem (very low-income) and the Upper East Side (high-income). The study looked at 173 East Harlem and 152 Upper East Side bodegas (stores with only one cash register) and grocery stores. They found that Upper East Side stores were 3.2 times more likely to stock all five recommended diabetes food items than East Harlem stores. In both neighborhoods, bodegas were less likely to carry all of the recommended food items compared with grocery stores. Yet, there were significantly fewer bodegas in the Upper East Side compared with the number of bodegas in East Harlem. In the Upper East Side, 65% of the stores were bodegas verses 87% in East Harlem.

Zenk et al. (2006) conducted a study of fruit and vegetable access in Detroit, Michigan. They found the quality of fresh produce in stores in low-income African American communities was significantly lower than middle-income racially heterogeneous communities. Furthermore, those living in the low-income African American communities were asked to pay a higher proportion of their income for this low quality produce. This, included with a poor perception of food store quality and cleanliness in the low-income communities, may lead to less fruit and vegetable consumption by residents of these communities.

In a 2007 study of preadolescent children assessing the relationships between neighborhood characteristics, grocery store availability and accessibility, and fruit and vegetable consumption, researchers found that children who lived in low poverty neighborhoods ate more fruits and vegetables than did children in high poverty neighborhoods. This could be due to higher access to grocery stores in the low poverty neighborhoods. There were nearly twice as many grocery stores in the low poverty neighborhoods compared with the high poverty neighborhoods. Additionally, 50% of the neighborhoods classified as high poverty had no grocery stores within their neighborhood, while only 24% of neighborhoods classified as low poverty had no grocery stores within their neighborhood (Mushi-Brunt, Haire-Joshu, Elliott, & Brownson, 2007).

ECOLOGICAL MODEL OF HEALTH

The ecological framework focuses on the connections between people and their environment—the space outside of the person (Glanz, Sallis, Saelens, & Frank, 2005; Stokols, 1996). Ecological models differ from other behavioral models because of the strong emphasis that ecological models place on the environment (Sallis & Owen, 2002). Incorporated into the ecological model of health and behavior are constructs from the fields of public health, health psychology, consumer psychology, and urban planning. Ecological models of health have been used to guide the development of measures for nutrition environments that support the study of environments and eating behaviors (Glanz, Sallis, Saelens, & Frank, 2005). Health behaviors can be influenced by individual-level factors, sociocultural factors, physical environments, policies, and

macro-level environments (Sallis & Owen, 2002; Storey, Kapingst, Robinson-O'Brien, & Glanz, 2008).

Figure 3 shows an ecological framework created by Storey, Kapingst, Robinson-O'Brien, & Glanz (2008) which describes the multiple influences that affect what people eat. Individual-level factors related to food choice include skills and behaviors, lifestyle, biological factors, demographics, and cognitions such as attitudes, preferences, knowledge and values. Social environmental factors include family, friends, and peers. Physical environments are the settings where people purchase or consume food. These include the home, work sites, schools, neighborhoods, restaurants, supermarkets, and convenience stores. Macro-level environmental factors are the societal and cultural norms and values, food and beverage industry, media, policies, economic systems, healthcare systems, land use, and transportation.

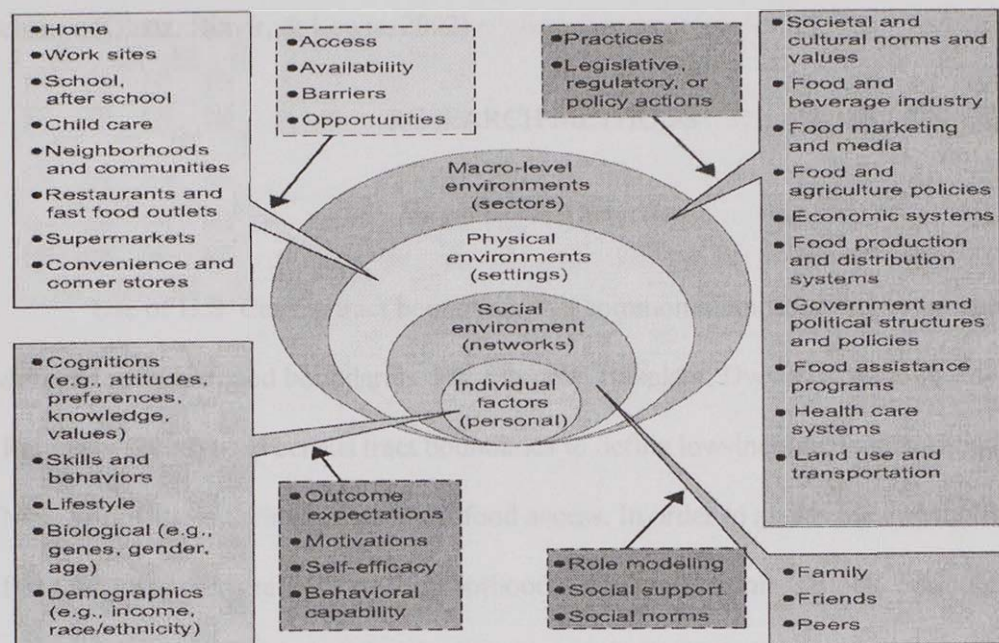


Figure 3: An ecological framework depicting the multiple influences on what people eat (Story, Kapingst, Robinson-O'Brien, & Glanz, 2008)

“A critical assumption of ecological models is that single-level interventions are unlikely to have powerful or sustained effects” (Sallis & Owens, 2002). Though the majority of health interventions continue to target only the individual, there is growing recognition that combined individual, community, and environmental interventions are needed for behavior change (Sallis & Owens, 2002; Glanz, Sallis, Saelens, & Frank, 2005; Story, Kapingst, Robinson-O'Brien, & Glanz, 2007; Liese, Weis, Pluto, Smith, & Lawson, 2007). Community and environmental factors that affect health behavior include: community design and resources, architectural features, weather, climate, food production and distribution, technology, and information resources (Sallis & Owens, 2002). Using theories and models, such as the ecological model of health, as a means for

informing research and practice, is essential to both health education and health behavior change (Glanz, Rimer, & Lewis, 2002).

RESEARCH METHODS

Neighborhood Selection

Use of U.S. Census tract boundaries is a common method among researchers in defining neighborhood boundaries. For example, Bakelaar, Dwyer, Roy, & Jones-Robinson (2006) used census tract boundaries to define low-income neighborhoods in New York City in their assessment of food access. In order to assess the distribution of fast food restaurants relative to neighborhood sociodemographics, Block, Scribner, & DeSalvo (2004) identified all fast food restaurants in the Orleans Parish in New Orleans, Louisiana, and then imported the restaurants into a census tract map. Researchers then compared the restaurant density of each neighborhood with the sociodemographics of that neighborhood. In a similar, but much larger study, researchers looked at the food environment across neighborhoods in three different states in relation to the neighborhood racial/ethnic composition. The study included 75 census tracts in North Carolina, 276 census tracts in Maryland, and 334 census tracts in New York (Moore & Diez Roux, 2006).

A number of researchers have expanded each of their census tract boundaries by a short distance in order to create a buffer around their defined neighborhoods. In Block, Scribner, & DeSalvo's (2004) study of New Orleans's neighborhoods, each census tract was expanded to include a .5 and a 1 mile buffer which allowed them to include shopping areas where more fast food restaurants may be located. Zank et al (2005) included a five

mile buffer around each census tract to “ensure that [they] could calculate supermarket accessibility for neighborhoods at the periphery.”

Morland, Wing, & Diez Roux (2002) make the argument for expanding census tract study area borders to account for people who live on the border of two census tracts. “Although research has shown that census tracts are good approximations for neighborhoods without information on people’s shopping habits there is no validation that people actually purchase food within their tract” (Morland, Wing, & Diez Roux, 2002). In a cross country study of six study sites each containing approximately 1,000 participants, completed by Moore, Diez Roux, Nettleton, & Jacobs (2006) it was found that 47% of study participants did most of their food shopping within one mile of their home. This may suggest that a one mile expansion of a census tract boundary is important to account for those people who live near the border of a census tract and to include food stores that are near, but not within, a census tract.

In addition to defining the boundaries of a neighborhood, studies comparing nutrition environments with specific characteristics of a neighborhood must also define those characteristics. Morland, Wing, Diez Roux, & Poole (2002) used the median value of homes in each census tract to define neighborhood wealth. Saelens, Glanz, Sallis, & Frank (2007) classified their neighborhoods as either high or low-income based on the census tract median income level as defined by the 2000 Census. And Zenk et al. (2005) classified their neighborhoods by population density, racial composition, and percentage of residents below the poverty line, all of which were defined using the 2000 Census data.

Store Classification

How researchers identify and classify the food stores in their studies of nutrition environments, varies little between studies. In their Nutrition Environment Measures Survey (NEMS) of four neighborhoods in Atlanta, Georgia, Glanz, Sallis, Saelens, & Frank (2007) classified food stores into two categories - grocery stores and convenience stores. Specialty food stores, (bakeries, butcheries, etc.) were excluded from their study due to lack of selection as were member only stores (Costco and Sam's Club) due to access restrictions. In addition to grocery stores and convenience stores, Morland, Wing, Diez Roux, & Poole (2002) added supermarkets into their study. Using the 1997 North America Industry Classification System (NAICS) researchers for this study defined supermarkets as "large, corporate-owned 'chain' stores", and grocery stores as "smaller noncorporate-owned food stores."

Liese, Weis, Pluto, Smith & Lawson (2007) classified the supermarkets, grocery stores, and convenience stores included in their study by showing cue cards to store managers with definitions for each store type. Stores with greater than two million dollars in annual sales were considered supermarkets, stores with less than two million dollars in annual sales were considered grocery stores, and stores with a very limited variety of foods often connected to a gas station were considered convenience stores. Moore, Diez Roux, Nettleton, & Jacobs (2007) assessed only supermarkets in their study of the associations between the local food environment and the diet quality of the residents. Supermarkets were defined as either being a "chain" store or as having more than 50 employees.

Survey Methods

Direct neighborhood observation, in which trained observers systematically document aspects of neighborhood environments using standardized operational definitions, is a data collection method that can be used to assess neighborhood characteristics that may have positive or negative implications for residents' health" (Zenk et al., 2007). Though research has shown the importance of conducting consumer and participant surveys, the methods for how to create and implement such surveys are not as clear. As part of the study looking at farm viability and food consumption in Missoula, Montana, researchers conducted a food consumption survey of Missoula County residents. Three different methods were used to survey county residents – mall intercept, mail-in, and convenience sampling of various agencies in the county. Each method relied on convenience sampling limiting the generalizability of the survey (Jacobson et al., 2004).

Morland, Diez Roux, & Wing (2006) conducted surveys of randomly selected residents from four previous selected study areas. Each resident was mailed a survey and then geocoded into a census tract to assess the relationship between their survey responses and characteristics of the neighborhood in which the respondent lives. Laraia, Siega-Riz, Kaufman, & Jones (2004) used a convenience sample of pregnant women obtained from four prenatal care clinics in order to assess the association between diet quality index during pregnancy and distance to closest supermarket. Participants' addresses and local food stores were geocoded to determine distance to the nearest stores for each participant.

CHAPTER III

METHODOLOGY

The purpose of the study was to examine the retail food environment, access to food, and food security in Missoula, Montana in relation to the socioeconomic and health status of its residents. Four different neighborhoods in Missoula were examined based on the average median family income level of each neighborhood as described in the 2000 U.S. Census. The retail food environment was examined using the Nutrition Environment Measures Survey (NEMS), food security, access to food, and health status was analyzed using a survey of food store patrons.

DESCRIPTION OF POPULATION

The setting for this study is Missoula Montana, located in the mountains of western Montana. The most recent U.S. Census (2000) puts Missoula's population at 57,000 with a growth rate of 6.1%. Approximately 94%, of Missoula residents are non-Hispanic white (<http://quickfacts.census.gov>). During the 2000 Census, the median household income in Missoula was \$30,366, and 19.7% of the population lived under the poverty level (<http://www.city-data.com>). The top two industries in Missoula are retail sales and wholesale trade sales (<http://quickfacts.census.gov>).

PROTECTION OF HUMAN SUBJECTS

The research project in its entirety was reviewed and approved by The University of Montana Institutional Review Board [IRB]. (See Appendix A)

SAMPLE SELECTION

Neighborhoods selected to be included in this study fell into four categories based on the neighborhoods' average median family income level as defined by the 2000 U.S. Census. Neighborhood boundaries were defined using census tracts from the 2000 U.S. Census. There were 14 census tracts in the Missoula city limits. The terms 'census tract' and 'neighborhood' will be used interchangeably throughout the study. Neighborhood median family income categories were categorized as follows – very low income: less than \$20,000; low income: \$20,000-\$30,000; medium income: \$30,000-\$40,000; high income: more than \$40,000. These income categories are based on the Montana state median income level (\$30,586) and the Missoula County median income level (\$40,311) as defined in the 2000 U.S. Census. Only one neighborhood fell into the very low income category, five neighborhoods fell into the low income category, three neighborhoods fell into the medium income category, and five neighborhoods fell into the high income category.

One census tract was selected from within each income category to be included in the study. Selected census tracts were similar in the number residents residing in the tract and the population density of the tract. The parameter of each selected census tract was expanded by one mile. This helped to account for people who live on the edge of a census tract who may shop for food in a neighboring census tract. Supermarkets, grocery stores, and convenience stores within each study census tract were identified using the yellow pages and scouting. The surveys were conducted using a convenience sample of people shopping at the food stores within each study neighborhood.

DATA COLLECTION

Data for the research project was collected at supermarkets, grocery stores, and convenience stores in four Missoula neighborhoods using the Nutrition Environment Measures Survey (NEMS) and a survey of food store patrons. Included in the survey of food store patrons is the Six-item Short form U.S. Household Food Security Module and the SF-12v2 Health Survey. Food stores closed to the public (e.g. stores within workplaces or private residential facilities) and those requiring membership cards (e.g. Costco) were excluded from the study as were specialty food stores (e.g. bakeries or butcheries) due to lack of selection. Each student researcher conducting the surveys carried letters defining the research project (Appendix B). The letter was useful to student researchers when explaining to store managers and inquisitive store patrons why they were conducting the surveys. Student researchers collected data in teams of two. Prior to collecting data, each student researcher completed the required sections of the University of Montana: Online Research and Ethics Course.

Both NEMS and the survey data were collected at two separate points in time. The first set of data was collected during late summer 2008 and the second set of data was collected during winter 2009. Collecting data during two different seasons helped control for seasonal variability (Jetter & Cassady 2006). Data collection for each of the survey methods is described below.

Nutrition Environment Measures Survey

Prior to NEMS data collection, all researchers attended a training session at which time they learned how to properly conduct a NEMS assessment and complete the measurement forms. Each supermarket, grocery store, and convenience store within the four selected neighborhoods were rated using NEMS (Appendix C). One of the two researchers at each store conducted the NEMS assessment while the other researcher conducted the survey of food store patrons. Each NEMS assessment was coded according to the store, store type, and neighborhood where the information was collected.

One week after the NEMS measures were completed, a reliability check was conducted. Ten percent of all of the stores assessed were reassessed. Researchers went back to the randomly selected stores and completed NEMS for a second time and the original results were compared with the re-test results and discrepancies were addressed. In order to establish inter-rater reliability, the researcher conducting the re-test measurement for each store was not the original researcher from that store.

Survey of Food Store Patrons

Prior to conducting the survey, validity and reliability of the survey was assessed through peer evaluation and pretesting.

While at each supermarket, grocery store, and convenience store, a survey was given to individuals eighteen years of age or older who were shopping at the store and who were willing to complete the survey (Appendix D). One of the two researchers at the store stood at the entrance to the store and asked store patrons to volunteer to complete the survey. As an incentive for completing the survey, each volunteer received a one-

dollar Montana lottery ticket. Each survey was coded according to the store, store type, and neighborhood where the information was collected.

DATA ANALYSIS

Data analysis was conducted using the statistical software system Statistical Package for the Social Sciences (SPSS). Store quality scores were derived from the NEMS scoring system for stores (Appendix E). The SF-12v2 Health Survey (Ware, Kosinski, Turner-Bowker, & Gandek, 2002) and the Six-item Short form U.S. Household Food Security Module (Blumberg, Bialostosky, Hamilton, & Briefel, 1999) included in the survey of food store patrons each provide a standardized method for compiling and analyzing their scores. Data analysis for each research question is described below.

Q1. What is the relationship between neighborhood median income level in Missoula, Montana and the accessibility of healthy food?

- a. What is the proportion of retail food stores in very low-income, low-income, medium-income, and high-income Missoula neighborhoods?*

Data was analyzed for this question using percentages and comparisons. Significance was analyzed using a chi-square test.

- b. What is the nutritional quality of retail food stores in very low-income, low-income, medium-income, and high-income Missoula neighborhoods?*

Data for this question was analyzed using mean values and standard deviation for each variable. An analysis of variance (ANOVA) was run to test for significance. If

significance is found, then pair-wise comparisons (T-test) was run between important variables.

Q2. Is there a relationship between grocery shopper characteristics (including: food security, number of people shopped for in household, distance traveled to food store, mode of transportation, time spent grocery shopping per week, and average amount of money spent on groceries per week) and the nutritional quality of the food store he/she chooses to shop at?

Data for this question was analyzed using mean values and standard deviation for each variable. An analysis of variance (ANOVA) was run to test for significance within each category. If significance was found, then pair-wise comparisons (T-test) were run between important variables

Q3. Is there a relationship between the nutritional quality of retail food stores within a neighborhood and the health status of the people who shop at the retail food stores in that neighborhood?

Data for this question was analyzed using mean values and standard deviation for each variable. An analysis of variance (ANOVA) was run to test for significance. If significance was found, then pair-wise comparisons (T-test) were run between important variables.

Q4. Why do grocery shoppers choose to shop at certain food stores?

CHAPTER IV

Data for this question was analyzed using percentages and comparisons. Significance was analyzed using a chi-square test.

Q5. How do grocery shoppers in each neighborhood access food stores?

a. How far do grocery shoppers travel to food stores?

b. How far are grocery shoppers willing to travel to food stores?

Data for this question was analyzed using percentages and comparisons. Significance was analyzed using a chi-square test.

CHAPTER IV

The purpose of this study was to examine the retail food environment, access to food, and food security in Missoula, Montana in relation to the socioeconomic and health status of its residents. This chapter contains the reported results for each research question as well as a short explanation of the results at the end of each section.

RESULTS

A total of 523 surveys were handed out to food store shoppers at the 37 stores assessed. Survey respondents had the option of filling out the survey at the store or taking it home to fill out and mail back in. Of the surveys handed out, 198 (105 from the September data collection and 93 from the February data collection) were returned and used for analysis, making for a 37% response rate. Of the surveys analyzed, 56.2% of respondents were female, 89.5% were non-Hispanic whites, and 46.1% had an annual income of less than \$30,000. The majority of respondents, 80.5%, attended at least some college, 18% only had their high school diploma or GED and 1.5% never finished high school. The ages of the respondents were evenly distributed across the age range (18 to 64 years old), with those respondents age 65 and older accounting for the least percentage of responses at 9.8%. See Appendix F for a complete delineation of survey respondent characteristics according the neighborhood where they were surveyed.

RESEARCH QUESTIONS

Question 1. *What is the relationship between neighborhood median income level in Missoula, Montana and the accessibility of health food?*

a. *What is the distribution of retail food stores in very low income, low income, medium income, and high income Missoula neighborhoods?*

There were a total of 39 food stores within the four neighborhoods included in this research. Of those 37 were assessed. Two stores were not included because their management did not want to take part in the research. There were nine food stores in the very low income neighborhood, 12 in the low income neighborhood, 10 in the medium income neighborhood, and six in the high income neighborhood. The majority of the food stores in every neighborhood were convenience stores with the exception of the high income neighborhood where there was an even distribution of supermarkets and convenience stores within the neighborhood. The low income neighborhood had the highest number of convenience stores compared to the other neighborhoods. Neither the low income nor the high income neighborhoods had any grocery stores. *Table 1* shows the distribution of food stores in each neighborhood by type and *Figure 4* is a visual depiction of the distribution of food stores in each neighborhood by type.

Neighborhoods by Median Family Income Level		Supermarkets N(%)	Grocery Store N(%)	Convenience Store N(%)	Total
	Very Low Income	2 (22.2)	1 (11.1)	6 (66.7)	9
	Low Income	3 (25.0)	0 (0.0)	9 (75.0)	12
	Medium Income	2 (20.0)	3 (30.0)	5 (50.0)	10
	High Income	3 (50.0)	0 (0.0)	3 (50.0)	6

Table 1 depicts the number and percentage of supermarkets, grocery stores, and convenience stores within the very low income, low income, medium income, and high income neighborhoods.



Figure 4 is a visual representation of the distribution of supermarkets, grocery stores, and convenience stores within the very low income, low income, medium income, and high income neighborhoods.

To examine the relationship between the distribution of supermarkets, grocery stores, and convenience stores within a neighborhood and neighborhood income level a Chi-square test of independence was performed. There was not a significant difference in the proportional distribution of food store type by neighborhood income level at the .05 level ($\chi^2 = 7.530, p = 0.275$). Due to the small number of stores in each of the four income-characterized neighborhoods, the neighborhoods were then dichotomized into a very low and low income group and a medium and high income group. A Chi-square test of independence was performed and again there was not a significant difference in the proportional distribution of food store type by neighborhood group income level at the .05 level ($\chi^2 = 2.500, p = 0.286$).

These results indicate that analyzed separately or as dichotomized neighborhood groups, there is not a significant difference in the proportional distribution of food store type by neighborhood income level.

b. What is the nutritional quality of the retail food stores in the very low income, low income, medium income, and high income Missoula neighborhoods?

The nutritional quality of a food store was reported on a scale where -9 is the lowest possible score a food store could receive and 42 is the highest possible score a food store could receive. The mean quality score for food stores in the very low income neighborhood was 17.44 ($SD = 12.14$). The mean quality score for food stores in the low income neighborhood was 14.12 ($SD = 11.24$). The mean quality score for food stores in the medium income neighborhood was 20.25 ($SD = 12.52$). And the mean quality score for food stores in the high income neighborhood was 20.50 ($SD = 12.17$). *Figure 5* is a

representation of the mean quality scores for the food stores in the very low income, low income, medium income, and high income neighborhoods.

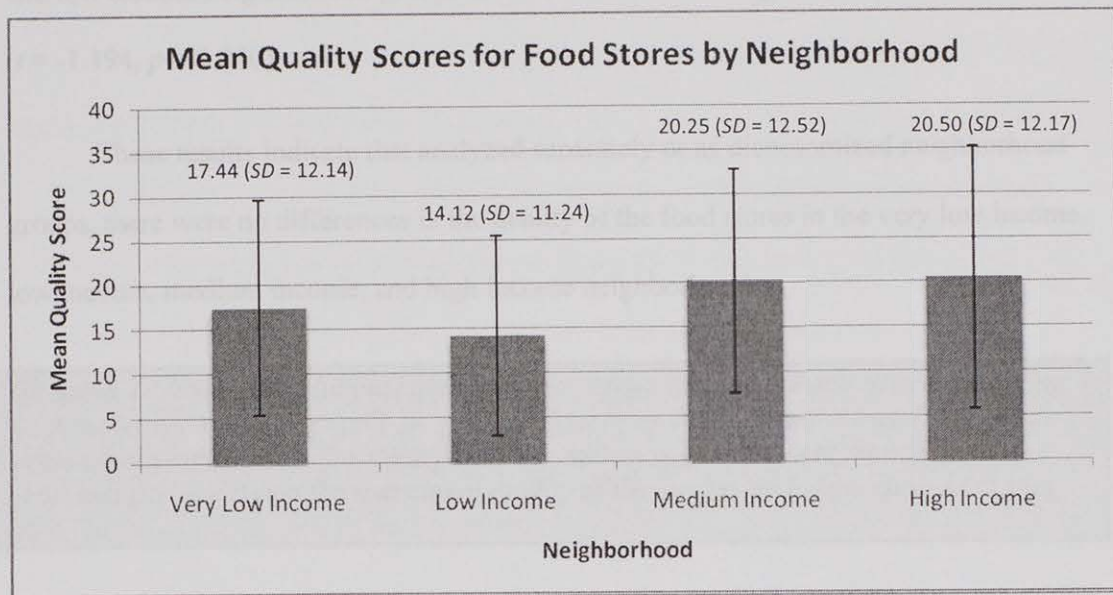


Figure 5 represents the mean quality score for the food stores in the very low income, low income, medium income, and high income neighborhoods.

A one-way analysis of variance test was used to test for significant differences in the quality scores of the food stores among the very low income, low income, medium income, and high income neighborhoods. The differences among the mean quality scores for food stores in each neighborhood were not significant at the .05 level [$F(3, 33) = 0.577, p = 0.634$]. After conducting the analysis of variance, the neighborhoods were dichotomized into two neighborhood groups and an independent-samples t test was run to test for a significant difference in the mean quality scores of the food stores in the very low and low income neighborhood group and the medium and high income neighborhood group. The mean quality food store score for the very low and low income neighborhood group was 15.55 ($SD = 11.46$) and the mean quality food store score for the medium and

high income neighborhood group was 20.91 ($SD = 12.90$). Though the medium and high income neighborhood group had a higher mean quality food store score than the very low and low income neighborhood group, the difference was not significant at the .05 level ($t = -1.194, p = 0.240$).

These results indicate that analyzed separately or as dichotomized neighborhood groups, there were no differences in the quality of the food stores in the very low income, low income, medium income, and high income neighborhoods.

Question 2. *Is there a relationship between grocery shopper characteristics (including: food security, number of people shopped for in a household, distance traveled to food store, time spent grocery shopping per week, and average amount of money spent on groceries per week) and the nutritional quality of the food store he/she chooses to shop at?*

A one way analysis of variance was used to test for differences between characteristics of food store shoppers and the nutritional quality of the food store where he/she chooses to shop. The results for each shopper characteristic are outlined below:

Food Security

Among respondents from all four neighborhoods, 134 respondents reported high food security, 22 respondents reported low food security, and 27 respondents reported very low food security. The mean quality score of the food stores shopped at by respondents who reported high food security was 23.79 ($SD = 12.44$). The mean quality score of the food stores shopped at by respondents who reported low food security was 26.02 ($SD = 11.74$). The mean quality score of the food stores shopped at by respondents who reported very low food security was 23.59 ($SD = 12.27$). The differences among the

mean quality scores for food stores shopped at by respondents reporting high food security, low food security, and very low food security were not significant at the .05 level [$F(2, 180) = 0.328, p = 0.721$].

Number of People Shopped for in Household

Among respondents from all four neighborhoods, 43 respondents reported food shopping for his/herself only, 80 respondents reported food shopping for two people, 58 respondents reported food shopping for between three and five people, and three respondents reported food shopping for more than five people. The mean quality score of the food stores shopped at by respondents who reported shopping for his/herself only was 23.51 ($SD = 12.67$). The mean quality score of the food stores shopped at by respondents who reported shopping for two people was 24.21 ($SD = 12.37$). The mean quality score of the food stores shopped at by respondents who reported shopping for between three and five people was 23.86 ($SD = 12.18$). The mean quality score of the food stores shopped at by respondents who reported shopping for more than five people was 33.00 ($SD = 0.87$). The differences among the mean quality scores for food stores shopped at by respondents reporting to food shop for his/herself only, for two people, for between three and five people, and for more than five people were not significant at the .05 level [$F(2, 180) = 0.564, p = 0.640$].

Distance traveled to Food Store

Among respondents from all four neighborhoods, 42 respondents reported traveling less than one mile to the food store, 98 respondents reported traveling between one and five miles to the food store, 24 respondents reported traveling between 5 – 10 miles to the food store, and 20 respondents reported traveling more than 10 miles to the food store. The mean quality score of the food stores shopped at by respondents who reported traveling less than one mile to the food store was 23.48 ($SD = 12.23$). The mean quality score of the food stores shopped at by respondents who reported traveling between one and five miles to the food store was 24.36 ($SD = 12.46$). The mean quality score of the food stores shopped at by respondents who reported traveling between 5 – 10 miles to the food store was 23.00 ($SD = 13.07$). The mean quality score of the food stores shopped at by respondents who reported traveling more than 10 miles to the food store was 25.25 ($SD = 12.27$). The differences among the mean quality scores for food stores shopped at by respondents reporting to travel less than one mile, between one and five miles, between 5 – 10 miles, and more than 10 miles to the food store were not significant at the .05 level [$F(3, 180) = 0.171, p = 0.916$].

Time Spent on Grocery Shopping per Week

Among respondents from all four neighborhoods, 37 respondents reported spending less than one hour per week on grocery shopping, 89 respondents reported spending between one and two hours per week on grocery shopping, 40 respondents reported spending between two and three hours per week on grocery shopping, 14 respondents reported spending between three and four hours per week on grocery

shopping, and three respondents reported spending more than four hours per week on grocery shopping. Beyond the time actually spent at the food store, grocery shopping also included making grocery lists, clipping coupons, and transportation time to and from the store.

The mean quality score of the food stores shopped at by respondents who reported spending less than one hour per week on grocery shopping was 20.73 ($SD = 12.66$). The mean quality score of the food stores shopped at by respondents who reported spending between one and two hours per week on grocery shopping was 24.66 ($SD = 12.21$). The mean quality score of the food stores shopped at by respondents who reported spending between two and three hours per week on grocery shopping was 26.93 ($SD = 11.38$). The mean quality score of the food stores shopped at by respondents who reported spending between three and four hours per week on grocery shopping was 23.71 ($SD = 12.57$). And lastly, the mean quality score of the food stores shopped at by respondents who reported spending more than four hours per week on grocery shopping was 8.83 ($SD = 2.02$). The differences among the mean quality scores for food stores shopped at by respondents reporting to spend less than one hour, between one and two hours, between two and three hours, between three and four hours, and more than four hours per week on grocery shopping were significant at the .05 level [$F(4, 178) = 2.515, p = 0.043$].

After testing for significant difference among the mean quality scores of food stores using an analysis of variance, an independent-samples t test was used to compare differences in mean quality scores of food stores based on time spent grocery shopping per week between paired groups. Because multiple t tests were performed simultaneously to compare differences in mean quality scores, the Bonferroni correction was

implemented to avoid falsely giving the appearance of significant difference between paired groups. The results from these tests are outlined in *Table 2* below.

Time Spent on Grocery Shopping per Week	Respondents (N)	Mean Quality Score	Standard Deviation	t - value	p - value
		Food Stores			
< 1 hour	37	20.73	12.66	-1.63	0.106
1-2 hours	89	24.66	12.22		
< 1 hour	37	20.73	12.66	-2.27	0.027
2-3 hours	40	26.94	11.38		
< 1 hour	37	20.73	12.66	-0.75	0.455
3-4 hours	14	23.71	12.57		
< 1 hour	37	20.73	12.66	1.61	0.001
> 4 hours	3	8.83	2.02		
1-2 hours	89	24.66	12.22	-0.99	0.320
2-3 hours	40	26.94	11.38		
1-2 hours	89	24.66	12.22	0.27	0.788
3-4 hours	14	23.71	12.57		
1-2 hours	89	24.66	12.22	2.23	0.001
> 4 hours	3	8.83	2.02		
2-3 hours	40	26.94	11.38	0.88	0.379
3-4 hours	14	23.71	12.57		
2-3 hours	40	26.94	11.38	2.72	0.001
> 4 hours	3	8.83	2.02		
3-4 hours	14	23.71	12.57	1.99	0.001
> 4 hours	3	8.83	2.02		

Table 2 shows the comparisons of food store quality scores between paired groups based on hours spent grocery shopping per week. Significance is set at the .005 level.

Based on the Bonferroni correction, the alpha value of significance for this data was set at $p < .005$. The results from the independent-samples *t* tests with the Bonferroni correction indicate that there was a significant difference between the mean quality score for food stores shopped at by respondents who spend less than one hour per week on grocery shopping and respondents who spend more than four hours per week on grocery

shopping ($t = 1.61, p = 0.001$). There was a significant difference between the mean quality score for food stores shopped at by respondents who spend between one and two hours per week on grocery shopping and respondents who spend more than four hours per week on grocery shopping ($t = 2.23, p = 0.001$). There was a significant difference between the mean quality score for food stores shopped at by respondents who spend between two and three hours per week on grocery shopping and respondents who spend more than four hours per week on grocery shopping ($t = 2.72, p = 0.001$). And lastly, there was a significant difference between the mean quality score for food stores shopped at by respondents who spend between three and four hours per week on grocery shopping and respondents who spend more than four hours per week on grocery shopping ($t = 1.99, p = 0.001$).

Amount of Money Spent on Groceries per Week

Among respondents from all four neighborhoods, 34 respondents reported spending less than \$50.00 per week on groceries, 80 respondents reported spending between \$50.00 and \$100.00 per week on groceries, 59 respondents reported spending between \$100.00 and \$200.00 per week on groceries, and 10 respondents reported spending more than \$200.00 per week on groceries. The mean quality score of the food stores shopped at by respondents who reported spending less than \$50.00 per week on groceries was 26.09 ($SD = 11.71$). The mean quality score of the food stores shopped at by respondents who reported spending between \$50.00 and \$100.00 per week on groceries was 22.62 ($SD = 12.52$). The mean quality score of the food stores shopped at by respondents who reported spending between \$100.00 and \$200.00 per week on

groceries was 24.46 ($SD = 12.35$). The mean quality score of the food stores shopped at by respondents who reported spending more than \$200.00 per week on groceries was 25.85 ($SD = 12.49$). The differences among the mean quality scores for food stores shopped at by respondents reporting to spend less than \$50.00, between \$50.00 and \$100.00, between \$100.00 and \$200.00, and more than \$200.00 per week on groceries were not significant at the .05 level [$F(4, 179) = 0.690, p = 0.600$].

These results indicate that there was no relationship between respondent food security and the nutritional quality of the food store where he/she shops at. There was no relationship between the number of people shopped for in household and the nutritional quality of the food store being shopped at. There was no relationship between distance traveled to the food store by a respondent and the nutritional quality of the food store where he/she shops at. And lastly, there was no relationship between the amount of money spent on groceries per week by each respondent and the nutritional quality of the food store where he/she shops at. However, the results do indicate that there was a relationship between the time respondents spend on grocery shopping per week and the nutritional quality of the store where he/she shops at. Specifically, respondents who spend more than four hours per week grocery shopping shop at food stores with a lower quality score than respondents who spend less than four hours per week grocery shopping.

Question 3. *Is there a relationship between the nutritional quality of retail food stores within a neighborhood and the health status of the people who shop at the retail food stores in that neighborhood?*

A one way analysis of variance was used to test for significant differences between the health status of food store shoppers and the nutritional quality of the food stores in the neighborhood where they shop. Health status was analyzed and scored using the SF-12 Health Survey which itemizes health into eight health outcomes – general health, physical functioning, role physical, bodily pain, vitality, social functioning, role emotional, and mental health. Health outcomes were scored on a scale of 0 – 100, where 0 equals very poor health and 100 equals excellent health. The relationship between respondent health outcomes and the nutritional quality of the food stores within each neighborhood were analyzed. The results for general health, physical functioning, and bodily pain are outlined below:

General Health

Table 3 shows the reported general health score by respondents in each neighborhood, the number of respondents who reported each score, and the corresponding mean quality scores for food stores. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of general health in the very low income neighborhood were not significant at the .05 level [$F(3, 64) = 0.015, p = 0.998$]. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of general health in the low income neighborhood were not significant at the .05 level [$F(4, 44) = 1.609, p = 0.189$]. The differences among the

mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of general health in the medium income neighborhood were not significant at the .05 level [$F(3, 41) = 1.317, p = 0.282$]. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of general health in the high income neighborhood were not significant at the .05 level [$F(4, 17) = 1.451, p = 0.261$].

	Respondent		Food Store	
	General Health Score	N	Mean Quality Score	Standard Deviation
Very Low Income Neighborhood	0	0	-	-
	25	4	25.63	10.75
	50	23	26.07	10.92
	75	34	26.01	12.22
	100	7	25.07	13.22
Low Income Neighborhood	0	1	7.50	
	25	3	25.83	13.01
	50	16	23.56	12.48
	75	19	14.97	11.06
	100	10	21.20	13.31
Medium Income Neighborhood	0	0	-	-
	25	4	17.75	12.65
	50	14	29.50	7.22
	75	16	24.91	12.38
	100	11	23.32	13.95
High Income Neighborhood	0	1	10.50	-
	25	1	5.00	-
	50	9	28.33	13.23
	75	8	24.43	14.68
	100	3	35.00	0.00

Table 3 shows the reported general health score by respondents in the very low income, low income, medium income, and high income neighborhoods, the number of respondents who reported each general health score, and the corresponding mean quality scores for food stores.

Physical Functioning

Table 4 shows the reported physical functioning score by respondents in each neighborhood, the number of respondents who reported each score, and the corresponding mean quality scores for food stores. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of physical functioning in the very low income neighborhood were not significant at the .05 level [$F(4, 63) = 1.26, p = 0.296$]. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of physical functioning in the low income neighborhood were not significant at the .05 level [$F(4, 42) = 1.065, p = 0.386$]. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of physical functioning in the medium income neighborhood were not significant at the .05 level [$F(4, 39) = 1.112, p = 0.365$]. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of physical functioning in the high income neighborhood were not significant at the .05 level [$F(3, 18) = 0.942, p = 0.441$].

	Respondent		Food Store	
	Physical Functioning Score	N	Mean Quality Score	Standard Deviation
Very Low Income Neighborhood	0	2	24.00	14.85
	25	5	33.00	1.50
	50	4	17.38	16.61
	75	12	28.67	9.21
	100	45	25.23	11.97
Low Income Neighborhood	0	2	8.50	1.41
	25	1	35.50	-
	50	5	23.20	12.87
	75	7	22.50	12.18
	100	34	18.50	12.66
Medium Income Neighborhood	0	1	8.50	-
	25	1	34.00	-
	50	5	22.40	13.86
	75	6	30.67	5.16
	100	31	25.63	11.65
High Income Neighborhood	0	0	-	-
	25	0	-	-
	50	1	35.00	-
	75	3	35.00	0.00
	100	17	23.29	14.52

Table 4 shows the reported physical functioning score by respondents in the very low income, low income, medium income, and high income neighborhoods, the number of respondents who reported each physical functioning score, and the corresponding mean quality scores for food stores.

Bodily Pain

Table 5 shows the reported bodily pain score by respondents in each neighborhood, the number of respondents who reported each score, and the corresponding mean quality scores for food stores. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of bodily pain in the very low income neighborhood were not significant at the .05 level [$F(4, 63) = 1.26, p = 0.294$]. The differences among the

mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of bodily pain in the low income neighborhood were not significant at the .05 level [$F(4, 44) = 1.420, p = 0.243$]. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of bodily pain in the medium income neighborhood were not significant at the .05 level [$F(3, 40) = 0.527, p = 0.666$]. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey of bodily pain in the high income neighborhood were not significant at the .05 level [$F(3, 18) = 2.194, p = 0.124$].

Income Level	Bodily Pain Score	N	Mean Quality Score	
			Very Low Income	Low Income
Very Low Income	0	0		
	25	3	31.50	3.35
	50	4	36.25	17.25
	75	11	25.25	22.30
Low Income	0	0		
	25	1		
	50	7	3.00	14.14
	75	6	32.50	12.42
High Income	0	0		
	25	1		
	50	7		
	75	6		

Table 3 shows the reported bodily pain score by respondents in the very low income, low income, medium income, and high income neighborhoods, the number of respondents who reported each bodily pain score, and the corresponding mean quality scores for food stores.

Scores for the health outcomes role physical, vitality, social functioning, role emotional, and mental health follow the same pattern as the previously reported outcomes. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey for each health outcome in the very low income, low income, medium income and high income neighborhoods were not significant at the .05 level.

	Respondent		Food Store	
	Bodily Pain Score	N	Mean Quality Score	Standard Deviation
Very Low Income Neighborhood	0	2	33.50	1.41
	25	12	25.04	11.04
	50	3	33.17	1.15
	75	22	28.48	9.33
	100	29	25.05	13.51
Low Income Neighborhood	0	1	7.50	-
	25	4	26.75	11.69
	50	9	22.39	12.47
	75	14	14.36	10.77
	100	21	21.24	13.05
Medium Income Neighborhood	0	0	-	-
	25	3	33.50	0.86
	50	4	26.88	12.27
	75	11	25.55	12.39
	100	26	24.77	11.57
High Income Neighborhood	0	0	-	-
	25	1	35.00	0.00
	50	2	5.00	14.18
	75	6	25.92	12.42
	100	13	28.50	13.63

Table 5 shows the reported bodily pain score by respondents in the very low income, low income, medium income, and high income neighborhoods, the number of respondents who reported each bodily pain score, and the corresponding mean quality scores for food stores.

Scores for the health outcomes role physical, vitality, social functioning, role emotional, and mental health follow the same pattern as the previously reported outcomes. The differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the SF-12 Health Survey for each health outcome in the very low income, low income, medium income and high income neighborhoods were not significant at the .05 level.

Question 4. Why do grocery shoppers choose to shop at certain food stores?

Respondents were asked to identify the following factors as very important, important, or not important when choosing a food store to shop at: convenience to get to, frozen food selection, snack food selection, fruit and vegetable selection, bakery/deli, customer service, accepts food stamps/WIC checks, price of food, organic food selection, and specialty food items such as gluten or lactose free. Respondents were also given the option to choose 'does not apply to me' when rating the factors. Responses were categorized into two groups for analysis and reporting. Very important and important responses were combined to create the important category and not important and does not apply to me were combined to create the not important category.

Across all four neighborhoods respondents most commonly identified price of food, fruit and vegetable selection, and convenience to get to as the most important factors they consider when choosing a food store. Over 90% of respondents in all four neighborhoods identified these factors as important when choosing a food store. The factor that respondents reported as least important when choosing a food store across all neighborhoods was whether or not the store accepts food stamps or WIC checks. Only 10.9% of respondents in the very low income neighborhood, 16.3% of respondents in the low income neighborhood, 19.5% of respondents in the medium income neighborhood, and 4.8% of respondents in the high income neighborhood reported accepting food stamps or WIC checks as being important when choosing a food store. *Figure 6* shows the percent of respondents who identified each factor as important when choosing a food store in the very low income, low income, medium income, and high income neighborhoods.



Figure 6 shows the percent of respondents who identified each factor as important when choosing a food store to shop at by very low income, low income, medium income and high income neighborhoods.

A Chi-square test of independence was performed to examine the relationship between factors identified as important and not important by respondents in each neighborhood and neighborhood income level. The difference in the proportional distribution of respondents who indicated factors as important and not important by neighborhood income level were not significant at the .05 level for any of the factors. Table 6 shows the percent of respondents who chose each factor as important verses not important when choosing a food store to shop at by very low income, low income, medium income and high income neighborhood. Chi-square and *p*-values are given for each factor and represents the difference in proportional distribution of respondents who identified factors as important and not important by neighborhood income level

Neighborhoods by Income Level							
% of Respondents Who Chose Each Factor as Important or Very Important when Choosing a Food Store		Very Low Income	Low Income	Medium Income	High Income	Chi-Square	p-value
	Convenient to get to	91.1	95.9	93.3	90.9	.810	.847
	Frozen food selection	49.4	61.3	47.6	61.9	4.303	.231
	Snack food selection	32	42.8	30.9	23.8	4.299	.231
	Fruit/Vegetable selection	96.2	100	91	95.5	5.966	.113
	Bakery/Deli	66.3	71.4	67.4	76.2	1.004	.800
	Customer service	78.2	87.4	81.4	76.2	1.677	.642
	Accepts food stamps/WIC	10.9	16.3	19.5	4.8	3.447	.328
	Price of food	96.1	97.9	95.5	90.9	2.315	.510
	Organic food selection	62	53	65.2	61.9	1.776	.620
	Specialty food items	36.4	42.9	39.1	27.3	1.893	.595

Table 6 shows the percent of respondents who chose each factor as important when choosing a food store to shop at by very low income, low income, medium income and high income neighborhoods. Chi-square and *p*-values are given for each factor and represents the difference in proportional distribution of respondents who identified factors as important by neighborhood income level.

These results indicate that there was not a significant difference in the proportional distribution of respondents who identified convenience to get to, frozen food selection, snack food selection, fruit and vegetable selection, bakery/deli, customer service, accepts food stamps/WIC checks, price of food, organic food selection, and specialty food items as important by neighborhood income level.

Question 5. *How do grocery shoppers access food stores?*

a. *What form of transportation do grocery shoppers use to travel to food stores?*

For each neighborhood surveyed, the most commonly reported form of transportation used for getting to and from food stores was driving my own car. Over 85% of respondents drive their own car to get to and from food stores in all of the neighborhoods. The neighborhood that had the most respondents who drive with a friend or relative was the medium income neighborhood at 11.1%. Overall, only 1.5% of respondents take the bus with no respondents taking the bus in the low income and high income neighborhoods. The very low income neighborhood had the most respondents who walk to and from the food store at 24.4%, while the low income neighborhood had the least amount of respondents who walk to and from the food store at 2%. Next to driving your own car, riding a bike was the next overall most common form of transportation for getting to and from food stores at 21.1%. *Table 7* shows the distribution of transportation types used to get to and from food stores by survey respondents by very low income, low income, medium income, and high income neighborhood.

		Neighborhoods by Income Level				
Form of Transportation to Food Stores		Very Low Income	Low Income	Medium Income	High Income	ALL NEIGHBORHOODS
	% DRIVE OWN CAR	87.8	89.8	82.2	90.9	87.4
	% DRIVE WITH A FRIEND/RELATIVE	2.4	6.1	11.1	4.5	5.6
	% TAKE THE BUS	1.2	0.0	4.4	0.0	1.5
	% WALK	24.4	2.0	13.3	4.5	14.1
	% BIKE	17.1	2.0	17.8	4.5	21.1

Table 7 shows the form of transportation used to get to and from good stores by respondents who shop at food stores in the very low income, low income, medium income, and high income neighborhoods by percent

To examine the relationship between the type of transportation used to get to food stores by respondents within a neighborhood and neighborhood income level a Chi-square test of independence was performed. There was a significant difference in the proportional distribution of transportation type by neighborhood income level at the .05 level ($\chi^2 = 25.943, p = 0.011$). To test if the results would be significant with a larger number of respondents in each group, the neighborhoods were dichotomized into a very low and low income group and a medium and high income group and a Chi-square test of independence was performed. There was not a significant difference in the proportional distribution of transportation type by neighborhood group income level at the .05 level ($\chi^2 = 7.729, p = 0.316$).

These results indicate that analyzed separately, there was a significant difference in the proportional distribution of transportation type by neighborhood income level, but analyzed at dichotomized groups, there was not a significant difference in the proportional distribution of transportation type by neighborhood group income level.

b. *How far do grocery shoppers travel to food stores?*

Overall, 52.2% of respondents in all four neighborhoods travel between one and five miles to get to the food store. The very low income neighborhood had the lowest percent of respondents, 9.8%, who travel more than 10 miles to get to the food store, while the low income neighborhood had the highest percent of respondents, 18.4%, who travel more than 10 miles to the food store. The low income neighborhood also had the lowest percent of respondents, 12.6%, who travel less than one mile to get to the food store. *Table 8* shows the percent of respondents who travel less than one mile, between one and five miles, between five and ten miles, and more than ten miles to the food store by very low income, low income, medium income, and high income neighborhood.

Neighborhoods by Income Level					
	Very Low Income	Low Income	Medium Income	High Income	ALL NEIGHBORHOODS
Miles Traveled to Food Stores					
% Traveling < 1 MILE	25.6	12.2	26.7	22.7	21.8
% Traveling 1-5 MILES	52.4	51	55.6	50	52.2
% Traveling 5-10 MILES	12.2	18.4	6.7	13.6	12.7
% Traveling > 10 MILES	9.8	18.4	11.1	13.6	13.2

Table 8 shows the percent of respondents who travel less than one mile, between one and five miles, between five and ten miles, and more than ten miles to the food store by very low income, low income, medium income, and high income neighborhood.

To examine the relationship between the distance respondents travel to food stores within a neighborhood and neighborhood income level a Chi-square test of

independence was performed. There was not a significant difference in the proportional distribution of distances traveled to the food store by neighborhood income level at the .05 level ($\chi^2 = 7.636, p = 0.571$). To test if the results would be significant with a larger number of respondents in each group, the neighborhoods were dichotomized into a very low and low income group and a medium and high income group and a Chi-square test of independence was performed and as before there was not a significant difference in the proportional distribution of distances traveled to the food store by neighborhood group income level at the .05 level ($\chi^2 = 1.599, p = 0.660$).

These results indicate that analyzed as separate neighborhoods or as dichotomized neighborhood groups, there was not a significant difference in the proportional distribution of distances traveled by respondents to food stores by neighborhood or neighborhood group income level.

c. *How far are grocery shoppers willing to travel to food stores?*

Overall, the majority of survey respondents, 45%, were willing to travel between one and five miles to get to the food store. At 32.7%, respondents from the low income neighborhood were most willing to travel more than 10 miles to a food store compared to respondents from the very low income, medium income, and high income neighborhoods. Over half of respondents in the very low income neighborhood (51.9%) and in the medium income neighborhood (60%) were willing to travel between one and five miles to a food store. The high income neighborhood had the highest percent of respondents, 40.9%, willing to travel between 5 and 10 to a food store. *Table 9* shows the percent of respondents who were willing to travel less than one mile, between one and five miles,

These results indicate that analyzed as separate neighborhoods or as dichotomized neighborhood groups, there was not a significant difference in the proportional distribution of distances respondents were willing to travel to food stores by neighborhood or neighborhood group income level.

Food Store Access

The 2004 report from Schools Community Food and Agriculture Coalition (SCFAC) described the importance of transportation as a food-related issue that often falls under the radar (Jain, 2004; et al.). As community development initiatives, larger food markets and high quality food stores often move to suburban areas leaving neighborhoods with limited access to quality food stores (Jain, 2004). Thirty-seven percent of survey participants in the 2004 SCFAC study reported they walked or rode their bike to a food store at least some of the time. Our study found a significant difference in the type of transportation respondents used to get to food stores among the very low income, low income, medium income, and high income neighborhoods. Respondents in the very low income neighborhood were more likely to walk to the food store than respondents in the other neighborhoods and respondents in the very low income and medium income neighborhoods were more likely to ride their bike to the food store than respondents in the low income and high income neighborhoods.

CHAPTER V

DISCUSSION OF RESULTS

When testing for significant differences between certain variables, neighborhoods were analyzed separately and as dichotomized neighborhood groups. Neighborhoods were dichotomized into a very low and low income group and a medium and high income group. The very low and low income neighborhoods were paired together and medium and high income neighborhoods were paired together because of their similarities in location, relative income level, and population density.

Food Store Access

The 2004 report from Missoula Community Food and Agriculture Coalition (CFAC) described the importance of transportation as a food-related issue that often falls under the radar (Jacobson et al.). As community development increases, larger food outlets and high quality food stores often move to suburban areas leaving neighborhood residents with limited access to quality food stores (Jacobson, 2004). Thirty-seven percent of survey participants in the 2004 CFAC study reported they walked or rode their bike to a food store at least some of the time. Our study found a significant difference in the type of transportation respondents used to get to food stores among the very low income, low income, medium income, and high income neighborhoods. Respondents in the very low income neighborhood were more likely to walk to the food store than respondents in the other neighborhoods and respondents in the very low income and medium income neighborhoods were more likely to ride their bike to the food store than respondents in the low income and high income neighborhoods.

Thirty-three percent of the participants in the 2004 CFAC study indicated that being within walking/biking distance to a food store was at least somewhat of a concern for them (Jacobson et al.). However, our study did not determine whether or not walking or riding a bike to food stores was a concern for the respondents or limited their access to food. A common trend among respondents who drove to the food store rather than walk or bike was convenience. "The food store is on my way home from work" and "I have too many grocery bags to carry to walk or bike to the store" were both common responses respondents gave in regards to driving to the food store. These results are not surprising when considering the physical environment of the neighborhoods assessed. Aside from the very low income neighborhood, which was located in the down town area of Missoula and near The University of Montana where ample sidewalks and traffic signals may make it safer and easier for residents to walk to the food store, the other neighborhoods were not entirely walker or biker friendly. The low income neighborhood was located near a business district and an interstate highway where driving may be the most feasible means of travel. And the high income neighborhood had the largest land area of the neighborhoods (6.8 sq. miles) and was located in a hilly area where walking and biking may be more difficult.

The distance a person travels to a food store may correlate with access to healthy foods and income level. For example, low income individuals may not be able to afford to travel far from their neighborhood to buy foods and investigators report that low income neighborhood food stores are often of poorer nutritional quality than those of higher income neighborhoods (Glanz, Sallis, Saelens, & Frank, 2007; Horowitz, Colson, Hebert, & Lancaster, 2004; Jetter & Cassady, 2006; Moore & Diez Roux, 2006). It is

unclear whether or not these findings translate into poorer health outcomes or dietary intake in individuals that live in these neighborhoods. Our study found no significant difference in the distances respondents traveled to food stores or the distances respondents were willing to travel to food stores among the very low income, low income, medium income, and high income neighborhoods. Again, these results are not surprising when considering the relatively small size of Missoula. The majority of respondents across all four neighborhoods reported that they are willing to travel between one and five miles to a food store which would indicate they are willing to travel to most stores within Missoula city limits. This then leads us to believe that food store shoppers are not necessarily food shopping within their own neighborhood.

Research indicates that typically there are fewer high quality food stores such as supermarkets and more low quality food stores such as convenience stores located in low income neighborhoods compared with higher income neighborhoods (Glanz, Sallis, Saelens, & Frank, 2007; Horowitz, Colson, Hebert, & Lancaster, 2004; Jetter & Cassady, 2006; Moore & Diez Roux, 2006). Our findings contrast these studies showing no significant difference in distribution of food stores or the mean quality score of food stores among the four neighborhoods. Our data indicate that there was a fairly equal distribution of supermarkets, grocery stores, and convenience stores across the four neighborhoods. This would suggest that there is equal access to quality food stores by all Missoula residents regardless of neighborhood income level. That all Missoula residents have similar access to quality food may be another reason why we found no significant differences in food security or health status measures in our study.

Food Shopper Characteristics

Data showed a significant relationship between the time respondents spend grocery shopping per week and the nutritional quality of the store where he/she shops. Respondents who spend more than four hours per week grocery shopping reported shopping at food stores with significantly lower quality scores than respondents who reported spending less than four hours per week grocery shopping. While this would indicate that being a "smarter shopper" (clipping coupons, making grocery lists, choosing stores based on sales, etc.) translates into shopping at lower quality food stores, these data should be interpreted with caution as there were only three respondents who reported spending more than four hours per week grocery shopping out of 198 total respondents. In addition to this, NEMS only provides a score for the food quality of a store and does not assess the availability or quality of non-food items within a store. The shopper survey did not determine why shoppers were spending the amount of time they reported on grocery shopping per week or what items they were purchasing at the stores. Because the survey did not ask more questions about the types of food items being purchased or how shoppers allot their time grocery shopping during the week, it becomes difficult to draw definite conclusions for these results.

There was no relationship between respondent food security and the nutritional quality of the food store where he/she shops, number of people shopped for in household and the nutritional quality of the food store being shopped at, distance traveled to the food store by a respondent and the nutritional quality of the food store where he/she shops, and amount of money spent on groceries per week by each respondent and the nutritional quality of the food store where he/she shops. Previous research indicates that

there is a relationship between some of these characteristics, specifically food security and money spent on groceries per week, and quality of the nutrition environment being shopped in (Horowitz et al., 2004; Zenk et al. 2006). The 2004 CFAC study showed access to food items to be at least somewhat of a concern among participants. Fifty-three percent of participants in their study indicated the availability of foods they like to eat as at least somewhat of a concern for them and 51% reported having at least somewhat of a problem with the variety of foods available in their local stores (Jacobson et al.). Yet, based on the findings of our study, there was a fairly equal distribution of supermarkets, grocery stores, and convenience stores across all four neighborhoods. If the latter is true, then it is not surprising that we found no relationship between food store shopper characteristics in our study and the quality of the food store where he/she shops. If all food shoppers have access to quality food stores within the four neighborhoods, then they are not being forced to choose lower quality stores over higher quality stores based on characteristics such as food security or the amount of money they have to spend on groceries per week.

However, having an equal distribution of supermarkets, grocery stores, and convenience stores across all four neighborhoods does not address possible inconsistencies in price of food across neighborhoods or amount of money respondents spend on food per week. Though NEMS assesses price variances between healthy and unhealthy food items within a store when assigning quality scores for food stores, it does not assess differences in price of food items between food stores. A study conducted in Detroit, Michigan found that residents living in low income communities had to pay a higher proportion of their income for quality produce at food stores within their

neighborhoods compared residents living in middle income Detroit communities (Zenk et al., 2006). A separate study that compared the price and availability of a standard market basket of food items and a market basket with healthier versions of the same food items in 25 stores in neighborhoods of varying income levels in Los Angeles and Sacramento found that the healthier market basket was 17% - 19% more expensive across all neighborhoods compared with the standard market basket and that the higher cost of the healthier market basket was equal to 35% - 40% of the low-income consumers' food budget at \$2,410 a year (Jetter & Cassady, 2006).

Approximately 77% of participants in the 2004 CFAC study identified price of food as at least somewhat of a problem or concern for them and 65% of participants identified having enough money to buy the food they needed for themselves and their families as at least somewhat of a problem or concern for them (Jacobson et al.). Likewise, over 90% of participants in our study identified price of food as being an important factor when choosing a food store. We did not evaluate if having enough money to buy food was a concern. Future studies assessing access to quality food stores would also benefit from comparing costs of food items between lower income neighborhoods and higher income neighborhoods.

Health Status

The health status of grocery shoppers in this study was analyzed and scored using the SF-12 Health Survey which itemizes health into eight health outcomes – general health, physical functioning, role physical, bodily pain, vitality, social functioning, role emotional, and mental health – and applies a score of 0 to 100 for each outcome. The

relationship between each health outcome and the quality of the food store shopped at by respondents scoring a 0, 25, 50, 75, and 100 on the health survey for each health outcome was analyzed. There were no differences among the mean quality scores of food stores shopped at by respondents scoring a 0, 25, 50, 75, or 100 on the health survey for each health outcome in any of the four neighborhoods assessed. Although all health outcomes were analyzed, only general health, bodily pain and physical functioning were reported in the results section of this manuscript.

General health, bodily pain and physical functioning are thought to impact a persons' ability to physically access a food store. Although poor nutrition environments are believed to be related to an increase in overweight, obesity, and chronic disease (Glanz, Sallis, Saelens, & Frank, 2005), no previous research has been done to examine the associations between a persons' health status and the quality of the food store where he/she shops. That we did not find differences in any of the health outcomes and the quality of the food stores may be due to the low sample size or that no differences in these outcomes truly exist. If the latter reason is true, then it would appear that Missoula residents could access quality food store regardless of their health status. Again, this may directly relate to equal distribution of supermarkets, grocery stores, and convenience stores across all four neighborhoods. It is important to take into account that, though a validated survey was used to measure health status in this study, it relied on self-report. Future studies addressing this area should include objective data such as weight, BMI, blood pressure, etc. in addition to the SF-12 Health Survey.

Factors for Choosing Food Stores

Survey respondents were asked to rank the importance of the following factors when choosing a food store to shop at: convenience to get to, frozen food selection, snack food selection, fruit and vegetable selection, bakery/deli, customer service, accepts food stamps/WIC checks, price of food, organic food selection, and specialty food items such as gluten or lactose free. To analyze food store shopper responses regarding the importance of these factors, responses were categorized into two groups. Very important and important responses were combined to create the important category and not important and does not apply to me were combined to create the not important category. The not important and does not apply to me responses were combined because, though they differ in meaning, they elicit the same lack of consideration when shoppers are choosing a food store. There were no significant differences among the reported importance of factors considered by respondents in our study when choosing a food store in the very low income, low income, medium income, and high income neighborhoods.

Respondents across all four neighborhoods most commonly identified price of food, fruit and vegetable selection, and convenience to get to as the most important factors they consider when choosing a food store. This finding corresponds with previous research conducted in Missoula County which identified price/affordability, location, and convenience to be the top three reasons why respondents chose certain food stores over others (Jacobson et al., 2004). Whether a food store accepts food stamps/WIC checks was the least important factor considered when choosing a food store across all four neighborhoods in our study. Only 10.9% of respondents in the very low income neighborhood, 16.3% of respondents in the low income neighborhood, 19.5% of

respondents in the medium income neighborhood, and 4.8% of respondents in the high income neighborhood reported accepting food stamps/WIC checks as being important when choosing a food store. Although 65% of respondents in the 2004 CFAC study identified having enough money to buy the food they needed for themselves and their families as at least somewhat of a problem or concern for them, only 13.9% reported using food stamps within the past year and 9.3% reported using WIC checks within the past year (Jacobson et al.).

CONCLUSIONS

Based on the results of this study, certain conclusions can be made. First, due to the relatively small size of Missoula, neighborhood layout may have more to do with the types of food stores in a neighborhood than does the median income level of a neighborhood. Regardless of neighborhood income, each neighborhood assessed had at least two supermarkets and a minimum of three convenience stores. The low income neighborhood had the most convenience stores compared to the other neighborhoods, which could be due to the fact that the low income neighborhood was located near the interstate highway and a very busy commercial district where people may be more likely to be in their vehicles, making it necessary for the neighborhood to have more convenience stores (i.e. gas stations).

Neighborhood layout may also reflect types of transportation used to get to the food store more than neighborhood income level as well. Significantly more respondents reported that they walk to the food store in the very low income neighborhood compared with the other neighborhoods assessed. The very low income neighborhood was located in the down town area of Missoula and near The University of Montana where ample

sidewalks and traffic signals may make it safer and easier for residents to walk to the food store. This coincides with research done by Frank, Saelens, Powell, & Chapman (2007) which found that people living in environments that were more conducive to walking, drove less than people living in environments that were less conducive to walking.

On the other hand, significantly more respondents from the very low income neighborhood may have reported that they walk to the food store due to the high cost of maintaining personal transportation. Low income respondents from the 2004 CFAC study were also more likely to walk or ride their bicycles to the food store than medium or high income respondents (Jacobson et al.). Only three respondents from our study indicated that they walked to the store because of lack of other transportation. Additional research needs to be done to better understand why Missoula residents who walk or bike to the food store choose to do so.

Though our findings did not indicate a difference in health outcomes among respondents from the four neighborhoods assessed, recent research has linked living environments to the development of overweight and obesity. In their review of current research concerning the relationship between obesity and environment, Booth, Pinkston, & Poston (2005) found overweight and obesity to be linked with area of residence, personal resources, neighborhood walkability, television use, land use, sprawl, and poverty. As stated before, future studies addressing health in Missoula as related to the food environment should include objective data such as weight, BMI, blood pressure, etc. in addition to the SF-12 Health Survey.

Due to the lack of significant differences among the very low income, low income, medium income, and high income neighborhoods concerning food store access, food security, and health outcomes, it would appear that there is no relationship between the retail food environment in the four neighborhoods assessed and the food security or health status of food store shoppers within each neighborhood. This finding is contrary to previous research comparing food environments in low and high income neighborhoods. Numerous studies on nutrition environments and food access have found disparities between low income neighborhoods and higher income neighborhoods (Bakelaar, Dwyer, Roy, & Jones-Robinson, 2006; Glanz, Sallis, Saelens, & Frank, 2007; Horowitz, Colson, Hebert, & Lancaster, 2004; Jetter & Cassady, 2006; Moore & Diez Roux, 2006), which in turn relates to poor health outcomes (Zenk, et al., 2005) and lower food security (Zenk, et al., 2006). The 2004 CFAC study also found disparities between the food security of low income respondents verses higher income respondents. Low income respondents were more likely to skip a meal or limit the size of a meal due to lack of money than higher income respondents. However, respondents in this study reported health and medical costs as very important regardless of income level (Jacobson et al., 2004).

The difference in our findings compared to other studies on nutrition environments and food access could be due to differences in sample size and demographics in these studies. Aside from the 2004 CFAC study (Jacobson et al.), most research on nutrition environments and food access has been conducted in major metropolitan areas such as Los Angeles and Sacramento (Jetter & Cassady, 2006), Atlanta (Glanz, Sallis, Saelens, & Frank, 2007), New York City (Horowitz et al., 2004), and Detroit (Zenk et al., 2006). Populations in these cities are much larger and more

ethnically diverse than in Missoula. The neighborhoods assessed in the study conducted by Horowitz et al. (2004) in New York City consisted of a total of 364,000 residents ranging from 6% non-Hispanic white to 84% non-Hispanic white. The most recent U.S. Census (2000) puts Missoula's population at 57,000 and approximately 94% of Missoula's residents are non-Hispanic white (<http://www.quickfacts.census.gov>).

When considering that low quality food environments and low access to food stores are both related to less nutritious diets, greater risk for chronic diet-related disease (Zenk, et al., 2005), and lower food security (Zenk, et al., 2006), it is positive to note that there were no differences in the distribution of food stores or the mean quality score of food stores among the very low income, low income, medium income, and high income neighborhoods in our study, suggesting that there is equal access to quality food stores by all residents regardless of neighborhood income level.

LIMITATIONS OF THE STUDY

The limitations of the study were as follows:

1. Demographic information used to set parameters within the study were limited to 2000 U.S. Census data. The median income level of each neighborhood and neighborhood boundaries were defined using 2000 U.S. Census data.
2. Survey data collection and interpretation was limited due to the use of a convenience sample. Food store shopper surveys were conducted using a convenience sample of people shopping at the food stores within each neighborhood assessed.
3. Self-reporting was relied on to assess respondent food security and health status rather than objective data such as BMI or blood pressure.

4. Due to the limited number of census tracts in Missoula, census tracts assessed in this study were not randomly selected from within each income category but instead were selected based on location and similarities in population density.
 5. The distribution of food store shopper surveys among the very low income, low income, medium income, and high income neighborhoods was not consistent.
- Overall, 198 food store shopper surveys were returned and used for analysis. Of those, 82 were from the very low income neighborhood, 49 were from the low income neighborhood, 45 were from the medium income neighborhood, and 22 were from the high income neighborhood.

RECOMMENDATIONS FOR FUTURE RESEARCH

Based on the results and implications of this research study, recommendations for future research on nutrition environments can be made. The first of these recommendations would be to expand this research study beyond the retail food stores in the four neighborhoods assessed to all retail food stores of Missoula. This would provide for a more detailed picture of the retail food environment in Missoula including the relationship between food store distribution, neighborhood income level, food security and health in Missoula. Additionally, this research could be expanded to include restaurants in Missoula allowing for an overall assessment of the nutrition environment beyond just food that is purchased for consumption at home.

Because this research study is one of only two studies that have looked at the effects of the environment on food access, food security and health in Montana, another recommendation for future research would be to assess the retail food environments of

Because this research study is one of only two studies that have looked at the effects of the environment on food access, food security and health in Montana, another recommendation for future research would be to assess the retail food environments of other towns in Montana using the template created for this study. Conducting similar research in other Montana towns would provide baseline data for addressing food disparities that might exist and would allow health promotion professionals and nutrition advocates to make connections between the retail food environment and personal diet within each community. Lastly, it would be interesting to conduct similar research in cities of comparable size and demographics in other western states and regions in the United States in order to determine if regional differences exist for retail food environment, access to food, and health status of retail food shoppers.

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THE UNIVERSITY OF MICHIGAN-MEMPHIS
INSTITUTIONAL REVIEW BOARD (IRB)
CONSENT / APPLICATION
(Use for Human Subject Research)

At The University of Memphis (UM), the Institutional Review Board (IRB) is the national regulatory agency responsible for oversight of all research activities that involve human subjects performed in the U.S. Department of Health and Human Services' Federal Human Research Protection Regulations, the Code of Federal Regulations, and the National Commission on the Protection of Human Subjects of Research's ethical principles and guidelines.

Human subjects research requires registration and approval of each project. This process is approved for research projects involving human subjects. Faculty members who submit the forms and applications to the IRB are responsible for the ethical treatment of human subjects. The IRB is the national regulatory agency for the protection of human subjects of research. The IRB is the national regulatory agency for the protection of human subjects of research.

1. Administrative Information

APPENDIX A

Institutional Review Board Application

Name: _____ Title: _____ Department: _____

Project Title: _____

Project Number: _____

Project Start Date: _____

Project End Date: _____

2. Human Subjects Protection Training (All investigators, including graduate students, on the project must complete the required training prior to the start of the project.)

Investigator	IRB	IRB	IRB	IRB	IRB
Principal Investigator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Co-Investigator	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Graduate Student	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Postdoctoral Fellow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research Assistant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Research Assistant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Project Funding

Is grant application currently under review? ☐ Yes ☐ No

Is grant currently awarded? ☐ Yes ☐ No

Grant Number: _____

Grant Title: _____

Grant Period: _____

Is this part of your thesis or dissertation? ☐ Yes ☐ No

If not, does your institution provide a grant? ☐ Yes ☐ No

THE UNIVERSITY OF MONTANA-MISSOULA
INSTITUTIONAL REVIEW BOARD (IRB)
CHECKLIST / APPLICATION
(Use for Human Subject Research)

At The University of Montana (UM), the Institutional Review Board (IRB) is the institutional review body responsible for oversight of all research activities involving human subjects outlined in the U.S. Department of Health and Human Services Office of Human Research Protection (www.hhs.gov/ohrp) and the National Institutes of Health, Inclusion of Children Policy Implementation (<http://grants.nih.gov/grants/funding/children/children.htm>).

Instructions: A separate registration form must be submitted for each project. IRB proposals are approved for three years and must be continued annually. **Faculty members** may email the completed form as a Word document to the IRB at (IRB@umontana.edu). **Students** must submit a hardcopy of the completed form to IRB administrator, Colleen Hoffman at The Office of the Vice President for Research & Development located in University Hall 116.

1. Administrative Information

Project Title: Assessment of the Retail Food Environment, Food Security, and Access to Food in Missoula, Montana	
Principal Investigator: Blakely Brown	Title: HHP Associate Professor
Email address: blakely.brown@mso.umt.edu	
Work Phone: (406) 243-6524	Cell Phone: (406) 546-2147
Department: Health and Human Performance	Office location: 207 McGill Hall

2. Human Subjects Protection Training *(All investigators, including faculty supervisors, on this project must complete the self-study course on protection of human research subjects, available at the UM IRB website: www.umt.edu/research/irb.htm)*

NAME	PI	CO-PI	Faculty Supervisor or	Research Assistant	DATE COMPLETED HUMAN SUBJECTS PROTECTION COURSE
Blakely Brown	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8/31/08
Jennifer Elliott	<input type="checkbox"/>	X		<input type="checkbox"/>	6/23/08
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

3. Project Funding

Is grant application currently under review at grant funding agency? <input type="checkbox"/> Yes <input type="checkbox"/> No			Has grant proposal received approval and funding? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Agency	Grant No.	Start Date	End Date	PI
Is this part of your thesis or dissertation? YES			If yes, date you successfully presented your proposal to your committee: 8/21/08	

IRB Determination:

- ☐ Approved Exemption from Review Exemption # _____
☐ Approved by Expedited/Administrative Review
☐ Full IRB Determination
 ☐ Approved
 ☐ Conditional Approval (*see attached memo*) - IRB Chair Signature/Date: _____
 ☐ Conditions Met (*see attached memo*)
 ☐ Resubmit Proposal (*see attached memo*)
 ☐ Disapproved (*see attached memo*)

Final Approval by IRB Chair: _____ Date: _____

2. Subject Information:

a. How will subjects be recruited, and how will they be identified?

Study participants will be identified using a convenience sample of people shopping at the food stores (supermarkets, grocery stores, and convenience stores) within each of the four selected neighborhoods in the study. Subjects will be 18 years of age or older. The information provided by each subject will be confidential and anonymous.

b. Are any of the following involved?

Minor subjects (under 18 years of age)? ☐ Yes ☐ No

If yes, specify age range: _____

Subjects of a physically or mentally vulnerable population? ☐ Yes ☐ No

If yes, please explain why the subjects would be considered physically or mentally vulnerable: _____

c. How are subjects recruited or recruited? (attach report if at all types of recruitment, etc. that will be used in the recruitment process, then specify the IRB approval.)

Project staff will have been recruited through the University of Michigan's Office of Institutional Review, which will ask for volunteers to conduct a survey while standing at the entrance of retail food stores (supermarkets, grocery stores, and convenience stores) in the selected neighborhoods. Participants will have the option of telling the survey team to stop and then making a decision about whether to participate. Project staff will not approach anyone who is not in the survey area. Project staff will not be present if anyone is not participating in the survey.

4. Purpose of the Research Project (not to exceed 500 words): Briefly summarize the overall intent of the study. Your target audience is a non-researcher. Include in your description a statement of the objectives and the potential benefit to the study subjects and/or the advancement of your field. Generally included are literature related to the problem, hypotheses, and discussion of the problem's importance.

The purpose of the study is to examine the retail food environment, access to food, and food security in Missoula, Montana in relation to the socioeconomic and health status of its residents. Inadequate access to healthy food sources, such as supermarkets, may contribute to less-nutritious diets and an increased risk for chronic, diet-related diseases (Morland, Diez Roux, & Wing, 2006; Zenk et al., 2005). Research has shown that there is a relationship between neighborhood access to supermarkets and the prevalence of overweight and obesity (Morland, Diez Roux, & Wing, 2006). One of the many goals set forth by Healthy People 2010 is to educate the public about the long-term health consequences and risks associated with being overweight and how to achieve and maintain a healthy weight (DPHHS, 2000). The way to meet the goals of Healthy People 2010, is to determine the nutrition environment of a community, including access to food and food security, which will then provide a foundation for nutrition education, food-related advocacy, and informed strategies to improve the food environment.

Numerous studies on nutrition environments and food access have found disparities between low-income neighborhoods and higher-income neighborhoods in regards to access to supermarkets and healthier foods (Bakelaar, Dwyer, Roy, & Jones-Robinson, 2006; Glanz, Sallis, Saelens, & Frank, 2007; Horowitz, Colson, Hebert, & Lancaster, 2004). Access to affordable healthy foods of acceptable quality is an important component of community food security (Zenk et al., 2006). By conducting a cross sectional study of the retail food environment and access to food in Missoula, this study will contribute to the understanding of the local food environment and how health environments can influence the health and well-being of community residents.

5. Subject Information:

a. Human Subjects (*identify, include age/gender*):

Study participants will be identified using a convenience sample of people shopping at the food stores (supermarkets, grocery stores, and convenience stores) within each of the four selected neighborhoods in Missoula, Montana. Study participants will be 18 years of age or older. The information provided by each subject will be confidential and anonymous.

b. Are any of the following included?

Minors included (*under age 18, per Montana law*)? ☐ Yes ☐ No

If yes, specify age range: _____ to _____

Members of a physically, psychologically or socially vulnerable population? ☐ Yes ☐ No

If yes, please explain why the subjects would be considered physically, psychologically or socially vulnerable:

N/A

c. How are subjects selected or recruited? (attach copies of all flyers, advertisements, etc. that will be used in the recruitment process; these require UM IRB approval):

Project staff, who have successfully completed The University of Montana online research ethics course, will ask for volunteers to complete a survey while standing at the entrance of retail food stores (supermarkets, grocery stores, and convenience stores) in the selected neighborhoods. Participants will have the option of taking the survey home to fill out and then mailing it back in an already stamped addressed envelope. Participants who fill out the survey at the store and those who take the survey home will each be given a Montana scratch lottery ticket for their participation in this research project.

Each research assistant will have copies of a letter (see attached) explaining the research project for volunteers who would like to know more about the research.

d. How many subjects will be included in the study? 200-400

e. How will subjects be identified in your work papers and in your publications: *(may check more than one)*

☐ Identified by name and/or address or other

(If risk exists, secure written or verbal permission to identify; or, create a confidentiality plan.)

☐ Confidentiality Plan

(Identity of subjects linked to research, but not specific data [e.g., individuals identified in ICF but not included in publications]; identification key kept separate from data; or, data collected by third party [e.g., SurveyMonkey] and identifiers not received with data)

☐ Never know participant's identity

(e.g., anonymous survey; identity never tied to data)

f. Describe the means by which the human subject's personal privacy is to be protected, and the confidentiality of information maintained. If you are using a Confidentiality Plan (as checked above) include in your description a plan for the destruction of the confidential materials.

This is an anonymous survey. Each survey will be identified by a code representing the store, store type, neighborhood, and year. There will never be a name or other identifying information on any of the surveys.

6. Information to be Compiled

a. Explain where the study will take place *(physical location not geographic. If permission will be required to use any facilities, indicate those arrangements and attach copies of written permission):*

This study will take place at the entrance of retail food stores (supermarkets, grocery stores, and convenience stores) in four selected Missoula neighborhoods. Neighborhoods will be selected using census tract boundaries as defined in the 2000 U.S. Census, as well as, U.S. Census data on median household income level and census tract density. The principle investigator for this project will contact each store manager prior to collecting data to explain the project and ask permission to collect data at their store. Attached is a copy of the letter store managers will receive.

b. Subject matter or kind(s) of information to be compiled from/about subjects:

The survey asks questions regarding food access, food security, health, and general demographic type questions. Attached is a copy of the survey.

c. Activities the subjects will perform and how the subjects will be used. Describe the instrumentation and procedures to be used and kinds of data or information to be gathered. Provide enough detail so the IRB will be able to evaluate the intrusion from the subject's perspective:

Participants will voluntarily complete a paper and pencil survey. Participants will be identified using a convenience sample. Research assistants will ask for volunteers to complete a survey while standing at the entrance of retail food stores (supermarkets, grocery stores, and convenience stores) or to take a survey home to complete and mail in later. Participants will be given a Montana scratch lottery ticket for completing the survey. Each research assistant will have copies of a letter explaining the research project for volunteers who would like to know more about the research. The survey asks questions

regarding food access, food security, health, and general demographic type questions.

d. Is information on any of the following included? *(check all that apply)*:

☐ Sexual behavior

☐ Drug use/abuse

☐ Alcohol use/abuse

☐ Illegal conduct

☐ Information about the subject that, if it became known outside the research, could reasonably place the subject at risk of criminal or civil liability or be damaging to the subject's financial standing or employability.

e. Means of obtaining the information *(check all that apply)*:

☐ Field/Laboratory observation
questionnaire/instrument)

☐ In-person interviews/survey *(attach*

☐ Tissue/Blood sampling
questionnaire/instrument)

☐ Telephone interviews/survey *(attach*

☐ Measurement of motions/actions

☐ On-site survey *(attach questionnaire/instrument)*

☐ Use of standard educational tests, etc.

☐ Examine public documents, records, data, etc.

☐ Mail survey *(attach questionnaire/instrument)*

☐ Examine private documents, records, data, etc.

☐ Medical records *(require HIPAA form)*

☐ Other means *(specify)*:

f. Will subjects be *(check all that apply)*:

☐ Videotaped

☐ Audio-taped:

☐ Photographed

Explain how data will be used, how data will be destroyed, and who will transcribe:

N/A

g. Discuss the benefits of the research, if any, to the human subjects and to scientific knowledge *(if the subjects will not benefit from their participation, so state)*:

Subjects will not directly benefit from their participation in this research.

h. Outline the risks and discomforts, if any, to which the human subjects will be exposed *(such deleterious effects may be physical, psychological, professional, financial, legal, spiritual, or cultural. Some research involves violations of normal expectations, rather than risks or discomforts; such violations, if any, should be specified)*:

Participation in this research will not expose subjects to any risks or discomforts.

i. Describe the means to be taken to minimize each such deleterious effect or violation:

N/A

7. Consent

An informed consent form is required when a project involves more than minimal risk but may be used whenever the researcher desires. It may be helpful for the subjects to read about the experiment or project so that they are very clear as to what they are agreeing. (*Templates and examples of Informed Consent Forms are available at <http://www.umt.edu/research/irb/irbforms.htm>*).

- A copy of the consent form must be offered to all subjects, including parents/guardians of subjects less than 18 years of age (minors).
- Use of minors
 - All subjects under the age of 18 must have written parental or custodial permission.
 - Assent by minor subjects: All minor subjects are to be given a clear and complete picture of the research they are being asked to engage in, together with its attendant risks and benefits, as their developmental status and competence will allow them to understand.
 - All minors from 10 to 18 years of age are required to give written assent.
 - Minors less than 10 years of age and all individuals, regardless of age, with delayed cognitive functioning (or with communication skills that make expressive responses unreliable) will be denied involvement in any research that does not provide a benefit/risk advantage.
 - Good faith efforts must be made to assess the actual level of competence of minor subjects where there is doubt.
 - The Minor Assent Form must be written at a level that can be understood by the minor, and/or read to them at an age-appropriate level in order to secure verbal assent.
- Is a written informed consent form being used? ☐ YES (*attach copy*) ☐ NO (*justify below*)
- To waive the requirement for a written informed consent (ICF), describe your justification:

A written informed consent form will not be used in this research project. There is no risk to the subjects for their participation in this study. The introductory paragraph of the survey informs each subject of the voluntary nature of the survey and gives him/her the opportunity to stop the survey at any point.
- Is a written parental permission form being used? ☐ YES (*attach copy*) ☐ NO
- Is a written minor assent form being used? ☐ YES (*attach copy*) ☐ NO
- Will subject(s) receive an explanation of the research before and/or after the project?
☐ YES (*attach copy*) ☐ NO

The principal investigator agrees to comply with all requirements of The University of Montana-Missoula IRB, the U.S. Department of Health and Human Services Office of Human Research Protection Guidelines, and NIH Guidelines and further agrees to ensure all members of the Principal Investigator's team are familiar with the requirements and risks of this project, as well as, complete the Human Subject Protection Course available at <http://www.umt.edu/research/irb/irboverview.htm>.

Principal Investigator's Statement

I certify that the statements made in this request are accurate and complete. I also agree to the following:

- If I receive approval for this research project, I agree to inform the IRB in writing of any emergent problems. I further agree not to proceed with the project until the problems have been resolved.
- I will not make any significant procedural changes to procedures involving human subjects without submitting a written amendment to the IRB and will not undertake such changes until the IRB has reviewed and approved them.
- It is my responsibility to ensure that every person working with the human subjects is appropriately trained.
- I will not begin work on the procedures described in this protocol until I receive notice of approval from the IRB.
- I will keep a copy of this protocol (including all consent forms, questionnaires, and recruitment flyers) and all subsequent correspondence.

Signature of Principal Investigator: _____ Date: _____

Note: I AM AWARE THAT ELECTRONIC SUBMISSION OF THIS FORM FROM MY COMPUTER CONSTITUTES MY SIGNATURE.

Students Only (students must submit hardcopy of IRB application complete with original signature of faculty supervisor)

Faculty Supervisor Signature: _____ Date: _____

Phone: _____ Email: _____

(My signature confirms that I have read the IRB Application and attachments and agree that it accurately represents the planned research and that I will supervise this research project).

Letter to Store Managers

Dr. John E. Hill, R.A., CHES
Graduate School, Health Promotion
Department of Health and Human Performance
The University of Montana - Missoula, MT 59814
Phone: 406-556-1912
Email: jhill@lib.umn.edu

September 27, 2008

APPENDIX B

Letters Defining the Research Project

Dear Manager,

Our research group at the University of Montana is currently studying and documenting stores' efforts to improve the availability of healthy foods in their stores. The focus of our research is on understanding what stores do to make it easier for customers to buy healthy foods. We are also asking shoppers to participate in filling out a simple survey about what they buy and how they feel about getting healthy eating, and how they rate their health.

We are not inspectors or evaluators, but are interested in your comments. As researchers, we follow strict rules to protect any information we collect. We will assign an identification code number to your store, and only the research staff will see your individual responses. Information about your store will be available only to others before it is shared outside our staff, and the focus of your responses will be on the store.

Thank you for allowing us to spend a few minutes in your store to collect this information. Your participation in this research project is voluntary and you can return us at any time if you do not wish to have your store included in the research. If you have any questions or concerns, please contact me at 406-556-1912.

Best regards,

Dr. John E. Hill, R.A., CHES
Project Director

Letter to Store Managers

Jennifer Elliott, B.A., CHES
Graduate student, Health Promotion
Department of Health and Human Performance
The University of Montana – Missoula, MT 59812
Phone: 406-543-1810
E-mail: jennifer1.elliott@umontana.edu

September 2008

Dear Manager,

Our research group at the University of Montana is visiting local supermarkets, grocery stores, and convenience stores in Missoula to measure the availability of healthy foods in our town. Members of our research team are visiting stores to look at certain things such as the types and varieties of food in each store. We are also asking shoppers to volunteer to fill out a simple survey about where they get their food, how often they go grocery shopping, and how they rate their health.

We are **not** inspectors or evaluators, nor are we connected with your competitors. As researchers, we follow strict rules to protect any information we collect. We will assign an identification (ID) number to your store, and only the research staff will see your individual information. Information about your store will be combined with others before it is shared outside our staff, and the name of your store will not be used.

Thank you for allowing us to spend a few minutes in your stores recording this information. Your participation in this research project is voluntary and you may inform us at any time if you do not wish to have your store included in the research. If you have any questions or concerns, please contact me at 406-543-1810.

Best regards,

Jennifer Elliott, B.A., CHES
Project Director

Letter to Survey Volunteers

Jennifer Elliott, B.A., CHES
Graduate student, Health Promotion
Department of Health and Human Performance
The University of Montana – Missoula, MT 59812
Phone: 406-543-1810
E-mail: jennifer1.elliott@umontana.edu

September 2008

Dear Volunteer,

Our research group at the University of Montana is visiting local supermarkets, grocery stores, and convenience stores in Missoula to measure the availability of healthy foods in our town. Members of our research team are visiting stores to look at certain things such as the types and varieties of food in each store. We are also asking shoppers to volunteer to fill out a simple survey about where they get their food, how often they go grocery shopping, and how they rate their health.

The survey that you fill out will help us identify where and how people in Missoula are getting their food and how this could potentially relate to their health. As researchers, we follow strict rules to protect any information we collect. We will assign an identification (ID) number to your survey and no one will ever know who you are. The information that you provide will be combined with others so that we can get an overall assessment of Missoula food store shoppers.

Thank you for agreeing to be a part of this research project! Your participation in this research project is voluntary and anonymous. If you have any questions or concerns, please contact me at 406-543-1810.

Best regards,

Jennifer Elliott, B.A., CHES
Project Director



Form ID: []

☐ Country Store

☐ Community Store

☐ Other

☐ 10 ☐ 11 ☐ 12 ☐ 13 ☐ 14 ☐ 15

Enrollment ID: []-[]-[]-[]-[]

Form ID: []-[]-[]-[]

APPENDIX C

Nutrition Environment Measures Survey (NEMS)

Store Name: []-[]-[]-[]

Address: []-[]-[]-[]

Phone: []-[]-[]-[]

Store Type: []-[]-[]

Store Hours: []-[]-[]

Store Hours: []-[]-[]

Store Hours: []-[]-[]

Store Hours: []-[]-[]

Store Hours: []-[]-[]

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Store Name: []-[]-[]-[]

Address: []-[]-[]-[]

Phone: []-[]-[]-[]

Store Type: []-[]-[]

Store Hours: []-[]-[]

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Store Hours: []-[]-[]

Nutrition Environment Measures Survey (NEMS) **Food Outlet Cover Page**



Rater ID:

- ☐ Grocery Store
☐ Convenience Store
☐ Other _____

Store ID: - -

Date: / /
 Month Day Year

Start Time: : ☐ AM ☐ PM

End Time: : ☐ AM ☐ PM

Number of cash registers:

- ☐ SD ☐ FC ☐ FF ☐ Specialty ☐ Other

Restaurant ID: - -

Site Visit

Date: / /
 Month Day Year

Start Time: : ☐ AM ☐ PM

End Time: : ☐ AM ☐ PM

Menu/Internet Review

Date: / /
 Month Day Year

Start Time: : ☐ AM ☐ PM

End Time: : ☐ AM ☐ PM

Other Visit/Interview

Date: / /
 Month Day Year

Start Time: : ☐ AM ☐ PM

End Time: : ☐ AM ☐ PM

Comments: _____

Nutrition Environment Measures Survey (NEMS) **Cover Page**

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8250013302

Measure Complete ☐**Nutrition Environment Measures Survey (NEMS)****Measure #2: FRUIT**Rater ID: Store ID: --Date: / /

Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other**Availability and Price**

Produce Item	Available		Price	Unit #	pc	lb	Quality		Comments
	Yes	No					A	UA	
1. Bananas	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
2. Apples	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/> Red delicious								
	<input type="radio"/> _____								
3. Oranges	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/> Navel								
	<input type="radio"/> _____								
4. Grapes	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/> Red seedless								
	<input type="radio"/> _____								
5. Cantaloupe	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
6. Peaches	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
7. Strawberries	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
8. Honeydew Melon	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
9. Watermelon	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/> Seedless								
	<input type="radio"/> _____								
10. Pears	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/> Anjou								
	<input type="radio"/> _____								
11. Total Types: (Count # of yes responses)			<input type="text"/> <input type="text"/>						

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)

Measure #3: VEGETABLES

Rater ID: Store ID: - - Date: / /

Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other**Availability and Price**

Produce Item		Available		Price	#	Unit pc lb	Quality		Comments	
		Yes	No				A	UA		
1. Carrots	<input type="radio"/> 1 lb bag <input type="radio"/> _____	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
2. Tomatoes	<input type="radio"/> Loose <input type="radio"/> _____	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
3. Sweet Peppers	<input type="radio"/> Green bell peppers <input type="radio"/> _____	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
4. Broccoli	<input type="radio"/> Bunch <input type="radio"/> _____	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
5. Lettuce	<input type="radio"/> Green leaf <input type="radio"/> _____	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
6. Corn		<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
7. Celery		<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
8. Cucumbers	<input type="radio"/> Regular <input type="radio"/> _____	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
9. Cabbage	<input type="radio"/> Head <input type="radio"/> _____	<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
10. Cauliflower		<input type="radio"/>	<input type="radio"/>	\$ <input type="text"/> . <input type="text"/> <input type="text"/>	<input type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
11. Total Types:	(Count # of yes responses) <input type="text"/>									

Measure Complete ☐**Nutrition Environment Measures Survey (NEMS)**
MEASURE #4: GROUND BEEFRater ID: Store ID: - - Date: / /

Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other**Availability and Price**

Item	Available			Price/lb.	Comments
	Yes	No	N/A		

Healthier option:

1. Lean ground beef, 90% lean,
-
- 10% fat (Ground Sirloin)

☐ ☐\$.**Alternate Items:**

2. Lean ground beef, (<10% fat)

 % fat☐ ☐ ☐\$.

3. Ground Turkey, (≤10% fat)

 % fat☐ ☐ ☐\$.

4. # of varieties of lean ground beef (≤10% fat)

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6+**Regular option:**

5. Standard ground beef, 80% lean,
-
- 20% fat

☐ ☐\$.**Alternate Item:**

6. Standard alternate ground beef, if
-
- above is not available

 % fat☐ ☐ ☐\$.

Comments

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)

MEASURE #5: HOT DOG

Rater ID: Store ID: - - Date: / /

Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other

Availability and Price

Item	Available			Price/pkg.	Comments
	Yes	No	N/A		

Healthier option:

1. Oscar Mayer Fat-free Wieners
(turkey/beef) 0g fat

☐ ☐
\$.

Alternate Items: (\leq 9g fat)

2. Fat-free other brand 0g fat

☐ ☐ ☐

Brand name

Kcal/svg

\$.

3. Light Wieners (turkey/pork)

☐ ☐ ☐
\$.

4. Light beef Franks (usually 1/3 less
calories, 50% less fat)

☐ ☐ ☐
\$.

5. Turkey Wieners
(1/3 less fat)

☐ ☐ ☐
\$.

6. Other

☐ ☐ ☐
\$.
 oz pkg Hot dogs/pkg

 g fat kcal/svg

Regular option:

7. Oscar Mayer Wieners
(turkey/pork/chicken)-regular 12g fat

☐ ☐
\$.

Alternate Items: (\geq 10g fat)

8. Beef Franks (regular)

☐ ☐ ☐
\$.

9. Other

☐ ☐ ☐
\$.
 oz pkg Hot dogs/pkg

 g fat kcal/svg

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)

MEASURE #6: FROZEN DINNERS

Rater ID:
 Date: / /
 Month Day Year

Store ID: - - -
☐ Grocery Store ☐ Convenience Store ☐ Other

A. Reference Brand

1. Stouffer's brand (preferred) ☐ Yes ☐ No

2. Alternate brand (with reduced-fat dinners available) Brand Name:

Comments: _____

B. Availability

1. Are reduced-fat frozen dinners available? (≤ 9 g fat/8-11 oz.) ☐ Yes ☐ No

Shelf space: (measure only if reduced-fat frozen dinners are available)

2. Reduced-fat dinners/regular dinners: Proportion ☐ $\leq 10\%$ ☐ 11-33% ☐ 34-50% ☐ 51%+

C. Pricing (All items must be same brand)

Reduced-Fat Dinner	Price/ Pkg	Regular Dinner	Price/ Pkg	Comments
1. Lean Cuisine Lasagna <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	Stouffer's Lasagna <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	
2. Lean Cuisine Roasted Turkey Breast <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	Stouffer's Roasted Turkey Breast <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	
3. Lean Cuisine Meatloaf <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	Stouffer's Meatloaf <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	

Reduced-Fat Alternate (≤ 9 g fat)	Price/ Pkg	Regular Alternate (≥ 10 g fat)	Price/ Pkg	Comments
4. Other <input type="text"/> <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	Other <input type="text"/> <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	
5. Other <input type="text"/> <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	Other <input type="text"/> <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	
6. Other <input type="text"/> <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	Other <input type="text"/> <input type="text"/> oz. <input type="text"/> Kcal. <input type="text"/> g fat	\$ <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/>	

7422087785

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)

MEASURE #7: BAKED GOODS

Rater ID: Store ID: - - - Date: / /

Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other**Availability & Price**Low-fat baked goods ≤ 3 g fat/serving

Item	Available Yes No	Amt. per package	g fat/ per item	kcal/ per item	Price	Comments
------	---------------------	---------------------	--------------------	-------------------	-------	----------

Healthier option:

1. Bagel Single ☐ Yes ☐ No ☐ N/A \$

Package ☐ Yes ☐ No ☐ N/A \$

Alternate Items:

Yes No N/A

2. English muffin ☐ Yes ☐ No ☐ N/A \$

3 a. Low-fat muffin

☐ Yes ☐ No ☐ N/A \$

b. # varieties of low fat muffins ☐ 0 ☐ 1 ☐ 2 ☐ 3+**Regular option (≥ 4 g fat/serving or 400 Kcal/serving):**

4. Regular muffin ☐ Yes ☐ No ☐ N/A \$

Alternate Items:

Yes No N/A

5. Regular Danish ☐ Yes ☐ No ☐ N/A \$

6. Other ☐ Yes ☐ No ☐ N/A \$

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS) MEASURE #8-CS: BEVERAGE

Rater ID: Store ID: - - Date: / /

Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other**Availability & Price****Healthier option:**

1. Diet Coke

Available

12 oz. ☐ Yes ☐ No20 oz. ☐ ☐

Price

Comments

\$. \$.

2. Alternate brand of diet soda

Yes No N/A

12 oz. ☐ ☐ ☐\$. 20 oz. ☐ ☐ ☐\$. **Regular option:**

3. Coke

12 oz. ☐ Yes ☐ No20 oz. ☐ ☐\$. \$.

4. Alternate brand of sugared soda

Yes No N/A

12 oz. ☐ ☐ ☐\$. 20 oz. ☐ ☐ ☐\$. **Healthier option:**

5. 100% juice, 15.2 oz.

Available

Yes No

☐ Minute Maid ☐ Tropicana ☐ Other☐ ☐\$. **Alternate Items:**

Yes No N/A

6. 100% juice, 14 oz.

☐ Minute Maid ☐ Tropicana ☐ Other☐ ☐ ☐\$. 7. 100% juice, oz.☐ Minute Maid ☐ Tropicana ☐ Other☐ ☐ ☐\$. **Regular option:**

8. Juice Drink, 15.2 oz

Yes No

☐ Minute Maid ☐ Tropicana ☐ Other☐ ☐\$. **Alternate Items:**

Yes No N/A

9. Juice Drink, 14 oz.

☐ Minute Maid ☐ Tropicana ☐ Other☐ ☐ ☐\$. 10. Juice Drink, oz.☐ Minute Maid ☐ Tropicana ☐ Other☐ ☐ ☐\$.

3722001173

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS) MEASURE #8-GS: BEVERAGE

Rater ID: Store ID: - - - Date: / /

Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other

Availability & Price

Healthier option:	Available size	Available Yes No	Price	Comments
1. Diet Coke	12 pack 12 oz.	<input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
		Yes No N/A		
	6 pack 12 oz.	<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
2. Alternate brand of diet soda		Yes No N/A		
<input type="text"/>	12 pack 12 oz.	<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
<input type="text"/>	6 pack 12 oz.	<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	

Regular option:		Yes No	Price	Comments
3. Coke	12 pack 12 oz.	<input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
		Yes No N/A		
	6 pack 12 oz.	<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
4. Alternate brand of sugared soda		Yes No N/A		
<input type="text"/>	12 pack 12 oz.	<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
<input type="text"/>	6 pack 12 oz.	<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	

Healthier option:		Yes No	Price	Comments
5. Minute Maid 100% juice, (64 oz., half gallon)		<input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
Alternate Items:		Yes No N/A		
6. Tropicana 100% juice, (64 oz., half gallon)		<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
7. Other: <input type="text"/>		<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	

Regular option:		Yes No	Price	Comments
8. Minute Maid juice drink, (64 oz., half gallon)		<input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
Alternate Items:		Yes No N/A		
9. Tropicana juice drink, (64 oz., half gallon)		<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	
10. Other: <input type="text"/>		<input type="radio"/> <input type="radio"/> <input type="radio"/>	\$ <input type="text"/> . <input type="text"/>	

2399270080

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)

MEASURE #9: BREAD

Rater ID:

Store ID: - -

Date: / /

Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other

Availability & Price

Item	Available			Loaf size (ounces)	Price/loaf	Comments
	Yes	No	N/A			

Healthier Option: Whole grain bread (100% whole wheat bread and whole grain bread)

1. Nature's Own 100% Whole Wheat Bread

☐ ☐

\$.

Alternate Items:

2. Sara Lee Classic 100% Whole Wheat Bread

☐ ☐ ☐

\$.

3. Other:

☐ ☐ ☐

\$.

4. # of varieties of 100% whole wheat bread and whole grain (all brands)

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6+

Regular Option: White bread (Bread made with refined flour)

5. Nature's Own Butter Bread

☐ ☐

\$.

Alternate Items:

6. Sara Lee Classic White Bread

☐ ☐ ☐

\$.

7. Other:

☐ ☐ ☐

\$.

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)

MEASURE #10: BAKED CHIPS

Rater ID:

Store ID: - -

Date: / /

Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other

Availability & Price

Low-fat chips ≤ 3 g fat/serving

Item	Available	Price	Comments
------	-----------	-------	----------

Healthier Option :

Yes No

1. Baked Lays Potato Chips

☐ ☐

\$.

☐ 1 1/8 oz. ☐ 10 oz.

☐ 2 1/8 oz. ☐ Other _____ oz.

☐ 5 1/2 oz.

Alternate Item:

Yes No N/A

2.

☐ ☐ ☐

\$.

☐ 1 1/8 oz. ☐ 10 oz.

☐ 2 1/8 oz. ☐ 12 oz.

☐ 5 1/2 oz. ☐ Other _____ oz.

3. # of varieties of low-fat chips (any brand)

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6+

Regular Option (select most comparable size to healthier option available):

Yes No

4. Lays Potato Chips Classic

☐ ☐

\$.

☐ 1 1/2 oz. ☐ 11 1/2 oz.

☐ 2 3/4 oz. ☐ 20 oz.

☐ 5 oz. ☐ Other _____ oz.

Alternate Item:

Yes No N/A

5.

☐ ☐ ☐

\$.

☐ 1 1/2 oz. ☐ 11 1/2 oz.

☐ 2 3/4 oz. ☐ 20 oz.

☐ 5 oz. ☐ Other _____ oz.

9831214200

Measure Complete ☐

Nutrition Environment Measures Survey (NEMS)

MEASURE #11: CEREAL

Rater ID:

Store ID: - -

Date: / /
Month Day Year

☐ Grocery Store ☐ Convenience Store ☐ Other

Availability & Price

Healthier cereals < 7 g sugar per serving

Item	Available			Size (ounces)	Price	Comments
	Yes	No	N/A			

Healthier Option :

1. Cheerios (Plain)

☐ ☐

\$

Alternate Item:

Yes No N/A

2. Other

☐ ☐ ☐

\$

3. # of varieties of healthier cereals

☐ 0 ☐ 1 ☐ 2 ☐ 3+

Regular Option (>7g of sugar per serving):

4. Cheerios (Flavored)

☐ ☐

\$

Alternate Item:

Yes No N/A

5. Other

☐ ☐ ☐

\$

Food Environment & Health Survey of Missoula

This is a short survey about the food environment and its relationship with health in Missoula. The survey will take approximately 10 minutes to complete. Your participation in this survey is completely voluntary and you are encouraged to answer as many questions as you can. You may stop the survey at any point. Your answers are anonymous and confidential. When you finish the survey please return it to the placement volunteer who handed it to you.

This survey is being conducted through the University of Montana and the Missoula County Community Food and Agriculture Coalition.

Shopping Habits

APPENDIX D

Food Environment and Health Survey of Missoula

1. Are you the primary grocery shopper in your household?

☐ Yes

☐ No

2. How many people in your household do you typically shop for?

☐ Just me

☐ 2-3

☐ 4

☐ 5+

3. How often do you do grocery shopping?

☐ Everyday

☐ Once every two weeks

☐ Once every 3 weeks

☐ Once a month

☐ Once a week

4. What form of transportation do you usually use to get to the store where you buy food?

☐ Drive my own car

☐ Walk

☐ Drive with a friend or relative

☐ Bike

☐ Bus

☐ Other

5. How far do you travel to shop at this store?

☐ Less than 1 mile

☐ 1-3 miles

____ - ____ - ____ - ____

Food Environment & Health Survey of Missoula

This is a short survey about the food environment and its relationship with health in Missoula. The survey will take approximately 10 minutes to complete. Your participation in this survey is completely voluntary and you may choose not to answer certain questions or to stop the survey at any point. Your answers are anonymous and confidential. When you finish the survey please return it to the assessment volunteer who handed it to you.

This survey is being conducted through the University of Montana and the Missoula County Community Food and Agriculture Coalition.

Shopping Habits

1. Are you the primary grocery shopper for your household?

☐ Yes

☐ No

2. How many people in your household do you typically shop for?

☐ Just me

☐ 2

☐ 3-5

☐ 5+

3. How often do you go grocery shopping?

☐ Everyday

☐ 2-3 times a week

☐ Once a week

☐ Once every two weeks

☐ Once a month

4. What form of transportation do you usually use to get to the store where you buy food?

☐ Drive my own car

☐ Drive with a friend or relative

☐ Bus

☐ Walk

☐ Bike

☐ Other: _____

Why? _____

5. How far do you travel to shop at this store?

☐ Less than 1 mile

☐ 1-5 miles

- ____ - ____ - ____ - ____
- ☐ 5-10 miles ☐ More than 10 miles
6. How far are you willing to travel to do your grocery shopping?
- ☐ Less than 1 mile ☐ 5-10 miles
- ☐ 1-5 miles ☐ More than 10 miles
7. How much time do you spend on grocery shopping in **1 week**? (this includes making a grocery list, coupon clipping, transportation to and from the store, etc.)
- ☐ Less than 1 hour per week ☐ 3-4 hours per week
- ☐ 1-2 hours per week ☐ More than 4 hours per week
- ☐ 2-3 hours per week
8. On average, how much do you spend on groceries in **1 week**?
- ☐ Less than \$50 per week ☐ \$100 - \$200 per week
- ☐ \$50 - \$100 per week ☐ More than \$200 per week
9. Is this the store where you do most of your food shopping?
- ☐ Yes
- ☐ No
10. Besides where you are shopping today, where else in Missoula do you shop for food most often? (check all that apply)
- | | |
|---|--|
| <input type="checkbox"/> Albertsons (N Reserve St) | <input type="checkbox"/> Wal-Mart (Highway 93) |
| <input type="checkbox"/> Albertsons (S Russell St) | <input type="checkbox"/> Pattee Creek Market |
| <input type="checkbox"/> Albertsons (Oxford St) | <input type="checkbox"/> Orange Street Food Farm |
| <input type="checkbox"/> Albertsons (E Broadway St) | <input type="checkbox"/> Grizzly Grocery |
| <input type="checkbox"/> Costco | <input type="checkbox"/> Worden's |
| <input type="checkbox"/> Good Food Store | <input type="checkbox"/> Farmers Market |
| <input type="checkbox"/> Safeway (W Broadway St) | <input type="checkbox"/> Other: _____ |
| <input type="checkbox"/> Safeway (S Reserve St) | <input type="checkbox"/> Other: _____ |
| <input type="checkbox"/> Rosauers | |
| <input type="checkbox"/> Wal-Mart (Mullan Rd) | |

Why? _____

11. How important are the following factors when choosing to shop at certain food stores over others?

Please check whether each factor is "very important", "somewhat important", "not very important", or "not at all important" to you. If you do not think that a factor applies to you, check "does not apply to me".

		Very Important	Somewhat Important	Not at all Important	Does Not Apply to Me
a.	Convenient to get to				
b.	Frozen food selection				
c.	Snack food selection				
d.	Fruit and Vegetable selection				
e.	Bakery/Deli				
f.	Customer Service				
g.	Accepts food stamps/WIC				
h.	Price of food				
i.	Organic food selection				
j.	Specialty food items (gluten/ lactose free)				
k.	Other:				

12. What types of foods do you buy most often? (check all that apply)

- ☐ Already prepared foods
☐ Raw foods

- ☐ Packaged foods
☐ Frozen foods

___ - ___ - ___ - ___

Food Security

Questions 13 and 14 contain statements that people have made about their food situation. For these statements, please check whether the statement was "often true", "sometimes true", or "never true" for you/your household **in the past 12 months**.

13. "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more."

☐ Often true

☐ Never true

☐ Sometimes true

☐ Don't know

14. "(I/we) couldn't afford to eat balanced meals."

☐ Often true

☐ Never true

☐ Sometimes true

☐ Don't know

15. In the **past 12 months** did you (or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

☐ Yes

☐ No

(If you answered No, skip question 16)

16. How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

☐ Almost every month

☐ Some months but not every month

☐ Only 1 or 2 months

17. In the **past 12 months**, did you ever eat less than you felt you should because there wasn't enough money to buy food?

☐ Yes

☐ No

18. In the **past 12 months**, were you ever hungry but didn't eat because there wasn't enough money for food?

- ☐ Yes
☐ No

Health

19. In general, would you say your health is:

- | | |
|------------------------------------|-------------------------------|
| <input type="checkbox"/> Excellent | <input type="checkbox"/> Fair |
| <input type="checkbox"/> Very good | <input type="checkbox"/> Poor |
| <input type="checkbox"/> Good | |

20. The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

a. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf

- ☐ Yes, limited a lot
☐ Yes, limited a little
☐ No, not limited at all

b. Climbing several flights of stairs

- ☐ Yes, limited a lot
☐ Yes, limited a little
☐ No, not limited at all

21. During the **past 4 weeks**, how much of the time have you had any of the following problems with you work or other regular daily activities as a result of your health?

a. Accomplished less than you would like

- | | |
|---|---|
| <input type="checkbox"/> All of the time | <input type="checkbox"/> A little of the time |
| <input type="checkbox"/> Most of the time | <input type="checkbox"/> None of the time |
| <input type="checkbox"/> Some of the time | |

_____ - _____ - _____ - _____

b. Were limited in the kind of work or other activities

- ☐ All of the time
☐ Most of the time
☐ Some of the time

- ☐ A little of the time
☐ None of the time

22. During the **past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

a. Accomplished less than you would like

- ☐ All of the time
☐ Most of the time
☐ Some of the time

- ☐ A little of the time
☐ None of the time

b. Did work or other activities less carefully than usual

- ☐ All of the time
☐ Most of the time
☐ Some of the time

- ☐ A little of the time
☐ None of the time

23. During the **past 4 weeks**, how much did pain interfere with your normal work (including both work outside the home and housework)?

- ☐ Not at all
☐ A little bit
☐ Moderately

- ☐ Quite a bit
☐ Extremely

24. These questions are about how you feel and how things have been with you during the **past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time in the **past 4** weeks...

a. Have you felt calm and peaceful?

- ☐ All of the time
☐ Most of the time
☐ Some of the time

- ☐ A little of the time
☐ None of the time

_____ - _____ - _____ - _____

b. Did you have a lot of energy?

- ☐ All of the time
☐ Most of the time
☐ Some of the time

- ☐ A little of the time
☐ None of the time

c. Have you felt downhearted and depressed?

- ☐ All of the time
☐ Most of the time
☐ Some of the time

- ☐ A little of the time
☐ None of the time

25. During the **past 4 weeks**, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

- ☐ All of the time
☐ Most of the time
☐ Some of the time

- ☐ A little of the time
☐ None of the time

Demographics

26. Current Age:

- ☐ 18-24
☐ 25-34
☐ 35-44

- ☐ 45-54
☐ 55-64
☐ 65+

27. Sex:

- ☐ Female
☐ Male

28. Ethnicity: (check all that apply)

- ☐ African American
☐ Hispanic/Latino
☐ Native Hawaiian/Pacific Islander
☐ Asian

- ☐ White, non Hispanic
☐ Native American
☐ Other: _____

29. Median family income in the **past 12 months**:

☐ \$ 00.00-\$20,000

☐ \$20,000-\$30,000

☐ \$30,000-\$40,000

☐ \$40,000-above

30. Years of school completed:

☐ Less than high school

☐ High school diploma/GED

☐ Some college/Associate degree

☐ College degree

☐ Graduate degree

Thank you for completing this survey!

NEMS Scoring Sheet for Stores

Store:

Item	Availability of Healthier Item	Avail Total Points	Price	Price Total Points	Quality	Quality Total Points
Milk	YES low-fat/skim = 2 pts Proportion (lowest-fat to whole) \geq 50% = 1 pt		Lower for lowest-fat = 2 pts Same for both = 1 pt Higher for low-fat = -1 pt			
Fruits	0 varieties = 0 pts < 5 varieties = 1 pt 5-9 varieties = 2 pts 10 varieties = 3 pts				25-49% acceptable = 1 pt 50-74% acceptable = 2 pts 75%+ acceptable = 3 pts	
Vegetables	0 varieties = 0 pts < 5 varieties = 1 pt 5-9 varieties = 2 pts 10 varieties = 3 pts				25-49% acceptable = 1 pt 50-74% acceptable = 2 pts 75%+ acceptable = 3 pts	
Ground Beef	YES lean meat = 2 pts 2-3 varieties \leq 10% fat = 1 pt > 3 varieties \leq 10% fat = 2 pts		Lower for lean meat = 2 pts Higher for lean meat = -1 pt			
Hot dogs	YES fat-free = 2 pts Light, not fat-free = 1 pt		Lower for fat-free = 2 pts Higher for fat-free = -1 pt If no fat-free but lower price for light = 1 pt			
Frozen dinners	YES all 3 reduced-fat types = 3 pts YES 1 or 2 reduced-fat types = 2 pts		*Lower for reduced-fat = 2 pts Higher for reduced-fat = -1 pt			
Baked goods	YES low-fat items = 2 pts		Lower for low-fat (per piece) = 2 pts Higher for low-fat (per piece) = -1 pt			
Beverages	YES diet soda = 1 pt YES 100% juice = 1 pt		Lower for diet soda = 2 pts Higher for 100% juice = -1 pt			
Bread	YES whole grain bread = 2 pts > 2 varieties whole wheat bread = 1 pt		Lower for whole wheat = 2 pts Higher for whole wheat = -1 pt			
Baked chips	YES baked chips = 2 pts > 2 varieties baked chips = 1 pt		Lower for baked chips = 2 pts Higher for baked chips = -1 pt			
Cereal	YES healthier cereal = 2 pts		**Lower for healthier cereal = 2 pts Higher for healthier cereal = -1 pt			
Availability Subtotal=			Price Subtotal=		Quality Subtotal=	
			Total NEMS Store Score =			

* Based on majority of frozen food items
**Per box of cereal

Ranges- Availability Subtotal: 0 to 30 Price Subtotal: -9 to 18 Quality Subtotal: 0 to 6
TOTAL NEMS SCORE RANGE: -9 to 42

Characteristics of Food Store Shoppers in Each Neighborhood Assessed

Food Store Shoppers Characteristics	Northside Neighborhood n=100	Midtown Neighborhood n=100	Southside Neighborhood n=100	Westside Neighborhood n=100	Total n=400
Age					
18-24	10	15	12	8	45
25-34	20	25	18	12	75
35-44	25	30	22	15	92
45-54	30	35	28	20	113
55-64	15	20	15	10	60
65+	5	10	8	5	38
Gender					
Male	45	50	40	35	170
Female	55	50	60	65	230
Ethnicity					
White	10	15	12	8	45
Black	20	25	18	12	75
Hispanic	25	30	22	15	92
Other	30	35	28	20	113
Income					
<\$10,000	10	15	12	8	45
\$10,000-\$19,999	20	25	18	12	75
\$20,000-\$29,999	25	30	22	15	92
\$30,000-\$39,999	30	35	28	20	113
\$40,000-\$49,999	15	20	15	10	60
\$50,000+	5	10	8	5	38
Education					
High School or less	10	15	12	8	45
Some College	20	25	18	12	75
College Graduate	25	30	22	15	92
Postgraduate	30	35	28	20	113

APPENDIX F

Characteristics of Food Store Shoppers by Neighborhood

Characteristics of Food Store Shoppers in Each Neighborhood Assessed

Food Store Shopper Characteristics	Very Low Income Neighborhood				Low Income Neighborhood				Medium Income Neighborhood				High Income Neighborhood				TOTAL	
	N				N				N				N				N	
TOTAL SHOPPERS	82				49				45				22				198	
AGE																		
18-24	13				4				12				1				30	
25-34	17				9				6				4				36	
35-44	9				15				8				7				39	
45-54	12				12				5				4				33	
55-64	19				6				8				4				37	
65+	12				2				4				1				19	
SEX																		
Female	46				30				22				11				109	
Male	36				16				20				10				82	
ETHNICITY																		
African American	0				1				0				0				1	
Hispanic/Latino	1				0				1				0				2	
Native Hawaiian/ Pacific Islander	0				0				1				0				1	
Asian	0				3				1				2				6	
Non-Hispanic White	75				40				36				19				170	
Native American	5				2				2				0				9	

Food Store Shopper Characteristics	Very Low Income Neighborhood				Low Income Neighborhood				Medium Income Neighborhood				High Income Neighborhood				TOTAL N
	N				N				N				N				
TOTAL SHOPPERS	82				49				45				22				198
MEDIAN YEARLY FAMILY INCOME																	
less than \$20,000	23				8				15				3				49
\$20,000-\$30,000	19				9				10				2				40
\$30,000-\$40,000	14				11				4				4				33
more than \$40,000	23				21				13				13				70
HIGHEST EDUCATION ACHIEVED																	
less than High School	1				0				2				0				3
High School diploma/GED	11				14				8				2				35
some college/Associate degree	31				14				22				8				75
College degree	24				18				6				8				56
Graduate degree	13				2				6				4				25
NUMBER OF PEOPLE SHOPPED FOR IN HOUSEHOLD																	
1	26				4				11				6				47
2	37				19				21				9				86
3-5	19				26				10				7				62
6+	0				0				3				0				3

Food Store Shopper Characteristics	Very Low Income Neighborhood					High Income Neighborhood					TOTAL N
	N					N					
TOTAL SHOPPERS	82					45				22	198
AMOUNT OF MONEY SPENT ON GROCERIES PER WEEK											
less than \$50	20					7				5	37
\$50-\$100	44					19				8	88
\$100-\$200	16					17				8	61
more than \$200	2					1				1	11

Project Timeline

July 2007 - July 2008

- Review literature
- Create and ground the local environment and activity survey
- Write the proposal

August 2008

- Project brief to friends etc
- Submit the proposal to IRE

September 2008 - October 2008

- Create the IRE and start the research
- Collect first set of data
- Conduct reliability check

January 2009 - February 2009

- Conduct NI and data collection to get the research completed
- Conduct reliability check on secondary research
- Collect second set of data
- Conduct a final check

March 2009 - May 2009

- Analyse data
- Create final report
- Define the explanation

APPENDIX G

Project Timeline

Project Timeline

May 2008 – July 2008

- Review literature
- Create and pretest the food environment and health survey
- Write thesis proposal

August 2008

- Propose thesis to committee
- Submit thesis proposal to IRB

September 2008 – October 2008

- Conduct NEMS and data collection training for research assistants
- Collect first set of data
- Conduct reliability check

January 2008 – February 2009

- Conduct NEMS and data collection training for new research assistants
- Conduct refresher training for returning research assistants
- Collect second set of data
- Conduct reliability check

March 2009 – May 2009

- Analyze all data
- Complete thesis writing
- Defend thesis to committee